Total Maximum Daily Loads

For

Big Blue River

Parameter of Concern: Atrazine & *E.Coli*

(BB1-10000, BB1-10100, BB1-10800, BB1-10900, BB1-20000, BB2-10000, BB2-20000, BB3-10000, BB3-10300, BB3-20000, BB4-10000, BB4-20000, BB4-20800, BB4-40000)

Nebraska Department of Environmental Quality
Planning Unit, Water Quality Division

August 2013

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Executive Summary

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As such, total maximum daily loads (TMDLs) must be developed for each parameter in accordance with the Clean Water Act. The information contained herein should be considered twenty-three (23) TMDLs. These TMDLs have been prepared to comply with the current applicable (1992) regulations found at 40 CFR Part 130.7.

1. Name and geographic location of the impaired waterbody for which the TMDLs are being developed.

Sub-Basin	Stream Name	Segment
BB1	Big Blue River	BB1-10000
BB1	Mission Creek	BB1-10100
BB1	Big Indian Creek	BB1-10800
BB1	Big Indian Creek	BB1-10900
BB1	Big Blue River	BB1-20000
BB2	Turkey Creek	BB2-10000
BB2	Turkey Creek	BB2-20000
BB3	West Fork Big Blue River	BB3-10000
BB3	Beaver Creek	BB3-10300
BB3	West Fork Big Blue River	BB3-20000
BB4	Big Blue River	BB4-10000
BB4	Big Blue River	BB4-20000
BB4	Lincoln Creek	BB4-20800
BB4	Big Blue River	BB4-40000

2. Identification of the pollutant and applicable water quality standard

Excessive Atrazine has been determined to be impairing the aquatic life beneficial use~~s~~ in these segments. *E. coli* has been determined to be impairing the Primary Contact Recreation beneficial use. Designated uses assigned to the above-identified segments can be seen in the table below.

Segment	Primary Contact Recreation	Aquatic Life Class		Water Supply Class		Aesthetics
		Coldwater	Warmwater	Public Drinking Water Supply	Agricultural Water Supply	
BB1-10000	**X (Impaired)**	--	**A (Impaired)**	**--**	A	X
BB1-10100	**X (Impaired)**	--	**A (Impaired)**	--	A	X
BB1-10800	**X (Impaired)**	--	**A (Impaired)**	--	A	X
BB1-10900	**--**	--	**B (Impaired)**	--	A	X
BB1-20000	**X (Impaired)**	--	**A (Impaired)**	--	A	X
BB2-10000	**X (Impaired)**	--	**A (Impaired)**	--	A	X
BB2-20000	**X (Impaired)**	--	**A (Impaired)**	--	A	X
BB3-10000	**X (Impaired)**	--	**A (Impaired)**	--	A	X
BB3-10300	**--**	--	**B (Impaired)**	--	A	X
BB3-20000	**X (Impaired)**	--	**A (Impaired)**	--	A	X
BB4-10000	**X (Impaired)**	--	**A (Impaired)**	--	A	X
BB4-20000	**X (Impaired)**	--	**A**	--	A	X
BB4-20800	**--**	--	**B (Impaired)**	--	A	X
BB4-40000	**--**	--	**B (Impaired)**	--	A	X

Designated Use by Stream Segment (NDEQ 2012)

Parameter	BB1-10000	BB1-10100	BB1-10800	BB1-10900	BB1-20000	BB2-10000	BB2-20000
E. coli	**X**	**X**	**X**		**X**	**X**	**X**
Atrazine	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Parameter	**BB3-10000**	**BB3-10300**	**BB3-20000**	**BB4-10000**	**BB4-20000**	**BB4-20800**	**BB4-4000**
E. coli	**X**		**X**	**X**	**X**		
Atrazine	**X**	**X**	**X**	**X**		**X**	**X**

Stream Impairments by Segment (NDEQ 2012)

3. Quantification of the pollutant load that may be present in the waterbody and still allows attainment and maintenance of the water quality standards.

The allowable pollutant load is based upon the available stream flow volume. That is, loading capacities are developed for each flow by multiplying the water quality standard (WQS) by the selected stream flow and a conversion factor (C) with the equation being:

Loading capacity = WQS x Flow x C

4. Quantification of the amount or degree by which the current pollutant load in the waterbody, including upstream sources that are being accounted for as background loading deviates from the pollutant load needed to attain and maintain water quality standards.

Atrazine TMDLs

Atrazine data for the impaired reaches indicates that several reaches exceed the chronic criteria (12 µg/l) based on the May-June seasonal assessment. A summary of the assessment can be seen in the following table:

Segment	Beneficial Use Governing Standard	Applicable Standard (µg/l)	Number of Samples	Number of Samples > WQS
BB1-10000	Aquatic Life	12	73	27
BB1-10100	Aquatic Life	12	8	3
BB1-10800	Aquatic Life	12	47	18
BB1-10900	Aquatic Life	12	17	10
BB1-20000	Aquatic Life	12	43	14
BB2-10000	Aquatic Life	12	53	16
BB2-20000	Aquatic Life	12	34	17
BB3-10000	Aquatic Life	12	59	18
BB3-10300	Aquatic Life	12	26	9
BB3-20000	Aquatic Life	12	8	4
BB4-10000	Aquatic Life	12	8	4
BB4-20800	Aquatic Life	12	47	12
BB4-40000	Aquatic Life	12	47	27

E. coli TMDLs

E. coli data for the impaired reaches indicates that all ten impaired reaches in this TMDL exceed the geometric mean standard of 126 cfu/100ml during the recreation season assessed. A summary of the assessment can be seen in the following table.

Impaired Segment	Waterbody Name	Seasonal Geometric Mean (#/100ml)	E.Coli Above WQS (#/100ml)
BB1-10000	Big Blue River	268	142
BB1-10100	Mission Creek	211	85
BB1-10800	Big Indian Creek	148	22
BB1-20000	Big Blue River	1414	1288
BB2-10000	Turkey Creek	1033	907
BB2-20000	Turkey Creek	1079	953
BB3-10000	West Fork Big Blue River	1699	1573
BB3-20000	West Fork Big Blue River	2019	1893
BB4-10000	Big Blue River	776	650
BB4-20000	Big Blue River	782	656

5. Identification of the pollutant source categories.

The entire Atrazine pollutant source has been determined to originate from nonpoint sources. Both point and nonpoint sources (including natural sources) have been identified to be contributing to the *E. coli* loads being delivered to the Big Blue River segments.

6. Wasteload allocations for pollutants from point sources.

The wasteload allocation for Atrazine will be zero (0) since the entire loading originates from non-point sources. For *E. coli*, the wasteload allocations for point source discharges will be equivalent to the water quality criteria associated with the primary contact recreation beneficial use – a geometric mean of 126 cfu (colony forming units)/100 ml.

7. Load allocations for pollutants from nonpoint sources.

Load allocations (LA) assigned to these TMDLs will be based upon the stream flow volume, applicable water quality standard and a unit conversion factor (a numeric factor used to multiply or divide a quantity when converting from one system of units to another) and will be defined using the following general formula:

$$LA_i = Q_i \times WQS \times C$$

Where:
LA_i = pollutant load allocation at the i^{th} flow
Q_i = stream flow at the i^{th} flow
WQS = Applicable water quality standard
C = unit conversion factor

Therefore the load allocation assigned to the Atrazine TMDL will be defined as:

$$LA_i = Q_i \times (WQS) \times 0.005382466$$

Where:
LA_i = load allocations (in kg) at the i^{th} flow
Q_i = stream flow (in cfs) at the i^{th} flow
WQS = water quality criteria for Atrazine in micrograms/liter (µg/l) based on most protective standard for the assigned beneficial uses (12 µg/l for Aquatic Life use)
0.005382466 = (28.316846592 x (60 x 60 x 24) x 2.2/1000000000) constant used to convert cfs times µg/l to lbs/day

And the load allocations assigned to the *E. coli* TMDLs will be defined as:

$$LA_i = Q_i \times 35{,}683.2 \text{ cfu/ft}^3 \times 86{,}400$$

Where:
LA_i = load allocations (in cfu/day) at the i^{th} flow
Q_i = stream flow (in cfs) at the i^{th} flow
35,683.2 cfu/ft^3 = 126/100ml (applicable/target water quality criteria for *E. coli* from Title 117) x 283.2 (factor to convert cfu/100ml to cfu/ft^3).
86,400 = value to convert cfs times cfu's to cfu's/day

8. Margin of safety.
For Atrazine the margin of safety will be implicit in that the load reduction calculated is based upon events during the months of May & June. This timeframe represents the critical conditions when runoff of Atrazine is likely to occur.

For *E. coli*, an explicit MOS of 10% will be utilized. Implementation of controls for both parameters will also result in year-round protection of water quality. This will be important should application practices change in the future.

9. Consideration for seasonal variation.
In Nebraska, Atrazine application can occur as early as late April and continues into the month of June. Runoff however is more typical during the May-June timeframe. For Atrazine, assessment and analysis of the data, as well as the TMDL, was based on the May-June timeframe when deviations from the water quality criteria have been historically observed. For *E. coli*, the water quality criteria are only applicable during the Title 117 defined recreation season that starts May 1 and ends September 30. Because of this, the water quality and stream volume data was limited to this time period.

10. Allowances for reasonably foreseeable increases in pollutant loads.
There was no allowance for future growth included in these TMDLs.

11. Implementation Plan
Reductions of *E. coli* will be targeted through a combination of regulatory and non-regulatory activities. Point sources will be regulated under the auspice of Title 119: National Pollutant Discharge Elimination System (NPDES) (NDEQ 2005) and the Rules and Regulations Pertaining to Title 130: Livestock Waste Control (LWC) (NDEQ 2011b). Nonpoint source pollution will be addressed using available programs, technical advice, information and education and financial incentives such as cost share. The lead agency

for water quality pesticide issues in Nebraska is the Department of Agriculture (NDA). Implementation of the reductions for Atrazine will be coordinated with the NDA.

The TMDLs included in the following text can be considered “phased TMDLs” and as such are an iterative approach to managing water quality based on the feedback mechanism of implementing a required monitoring plan that will determine the adequacy of load reductions to meet water quality standards and revision of the TMDLs in the future if necessary. A description of the future monitoring (Section 5.0) that is planned has been included.

Monitoring is essential to all TMDLs in order to:

- Assess the future beneficial use status;
- Determine if the water quality is improving, degrading or remaining status quo;
- Evaluate the effectiveness of implemented best management practices.

The additional data collected should be used to determine if the implemented TMDL has been or is effective in addressing the identified water quality impairments. The data and information can be used to determine if the TMDLs have accurately identified the required components (i.e. loading capacity, load allocations, etc.) and if revisions are appropriate.

1.0 Introduction

The Big Blue River (BB1-10000, BB1-20000, BB3-10000, BB3-20000, BB4-10000, BB4-20000, BB4-40000), Mission Creek (BB1-10100), Big Indian Creek (BB1-10800, BB1-10900), Turkey Creek (BB2-10000, BB2-20000), Beaver Creek (BB3-10300) and Lincoln Creek (BB4-20800) were identified as Category 5 streams in Nebraska's 2010 and 2012 Water Quality Integrated Reports (IR) (NDEQ 2010, NDEQ 2012a). Category 5 waterbodies comprise the Clean Water Act's Section 303(d) list of impaired waters and are required to have TMDLs. Data collected from 2001-2011 indicate the aquatic life, and primary contact recreation beneficial uses are impaired with the parameters of concern being Atrazine and *E. coli* respectively.

Based on the above, and as required by Section 303(d) of the Clean Water Act and 40 CFR Part 130, TMDLs have been developed for the Big Blue River basin waterbodies to address Atrazine and *E.Coli*. Therefore, the information contained herein should be considered twenty three (23) TMDLs. Although only the fourteen segments described are considered impaired, the relationship of water quality at the monitoring location and the watershed's contributions will be recognized. Concentration and load reduction activities will not be limited to the segments, rather the watershed as a whole.

1.1 Background Information

The Big Blue River is the major waterway in the Big Blue River Basin of Nebraska. The rivers headwaters originate southwest of Osceola, Nebraska and generally flow in an east/southeasterly direction before discharging past the Nebraska/Kansas border just south of Wymore, NE. There are six designated segments of the Big Blue River included in Title 117 – Nebraska Surface Water Quality Standards (NDEQ 2006) along with 57 designated tributaries, and three major tributaries (Figure 1.1).

1.1.1 Waterbody Description

1.1.1.1 Waterbody Name: Big Blue River (BB1-10000, BB1-20000, BB4-10000, BB4-20000, BB4-40000), Mission Creek (BB1-10100), Big Indian Creek (BB1-10800, BB1-10900), Turkey Creek (BB2-10000, BB2-20000), Beaver Creek (BB3-10300) and Lincoln Creek (BB4-20800) West Fork Big Blue River (BB3-10000, BB3-20000)

1.1.1.2 Major River Basin: Kansas

1*.1.1.3 Minor River Basin:* Big Blue

1.1.1.4 Hydrologic Unit Codes: 10270201, 10270202, 10270203, 10270204 and 10270205.

1.1.1.5 Beneficial Uses: Primary Contact Recreation, Warm water Aquatic Life - Class A and B, Agricultural Water Supply Class A and Aesthetics.

1.1.1.6 Major Tributaries: Turkey Creek (BB2-10000) Lincoln Creek (BB4-20800) West Fork Big Blue River (BB3-10000)

1.1.2 Watershed Characterization

1.1.2.1 Physical Features: The Big Blue watershed encompasses approximately 4,560 mi^2 (2,918,400 acres) in the southeastern part of the state. The basin originates in southern Hall and northern Adams County and initially extends in an easterly southeasterly fashion and ends at the Kansas/Nebraska border just south of Wymore. Approximately 2/3 of the basin lies within the Central Great Plains with the remaining 1/3 within the Western Corn Belt Plains (Chapman, et. al. 2001). Agriculture dominates the land use of the basin with over 2 million acres being considered suitable for irrigation. Corn, sorghum, soybeans and alfalfa are the major crops grown.

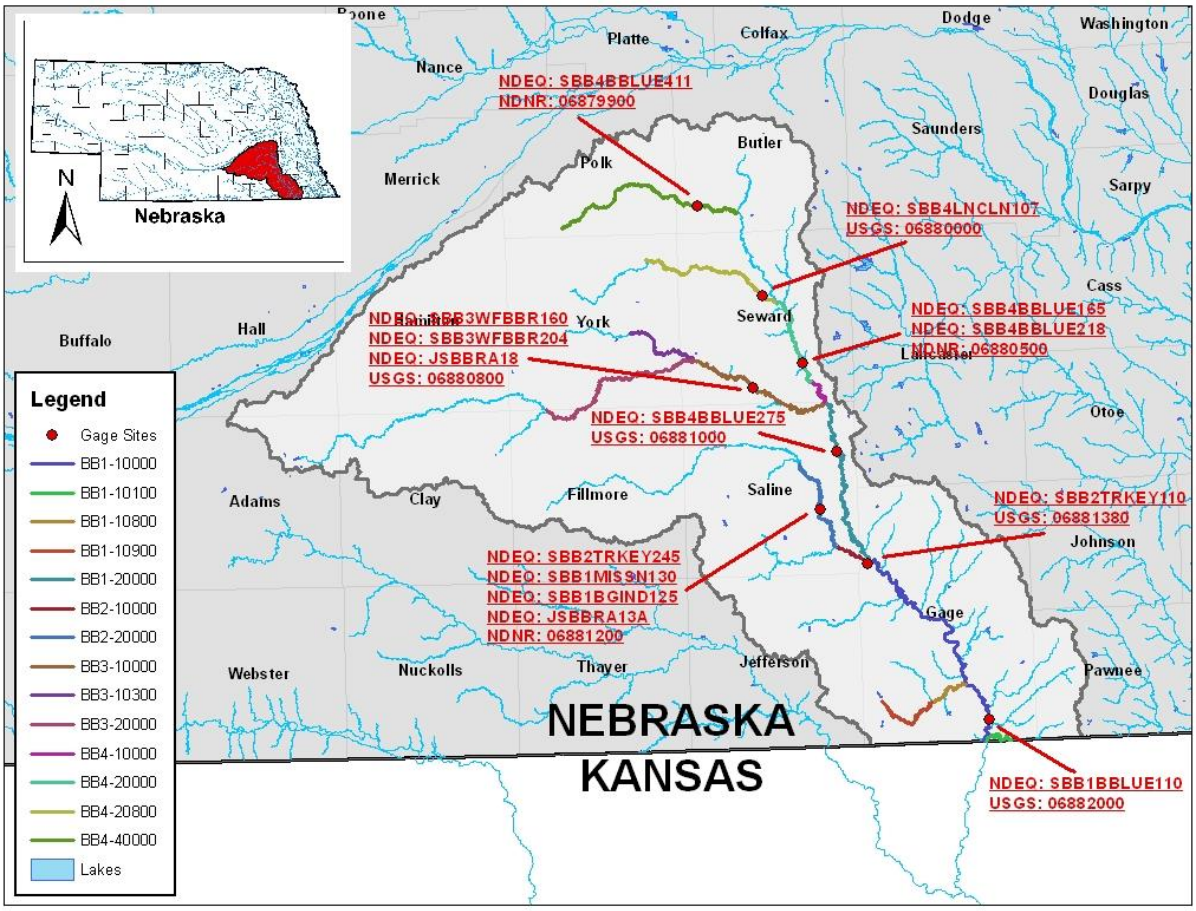

Figure 1.1.2: Big Blue River Watershed in the Big Blue River Basin

The upper (northern and western) portion of the basin lies in the loess plains over thick deposits of silt, sand and gravel while the lower basin (eastern and southern) lie in the glaciated area of the state where the plains give way to rolling hills with bedrock outcrops occurring near the Kansas border. Several soil associations are found in the Big Blue River basin with the most extensive being the Hastings- Crete association. These fertile loessial soils have developed on the level, gently sloping uplands with the Kennesaw-Holdrege, Crete-Fillmore and Crete-Wymore making up the remainder of the basin (NNRC 1975).

Stream flow in the basin is a function of the relatively impermeable soils within the basin that create low base flows and promote significant runoff during heavy or extended rainfall events. Flows can be highly variable. Stream flows are primarily derived from precipitation events with surface withdrawals and return flows also affecting the volume (NNRC 1975).

1.1.2.2 Climate: Precipitation in the watershed is approximately 27.5 inches (HPRCC 2010) with a majority of the precipitation occurring during the spring and summer months. Temperatures in the basin range from an average high between 90 - 100°F during the summer to average lows between 10 - 20°F during the winter.

1.1.2.3 Demographics: Seventy-seven municipal entities reside in the Big Blue basin boundaries and range from first class cities to villages to unincorporated communities. Some of the larger communities include: Hastings (24,907), Beatrice (12,459), York (7,766), Seward (6,964), Crete (6,960), Aurora (4,479), David City (2,906), Geneva (2,217), Milford (2,090), Wilber (1,855) Wymore (1,457), Sutton (1,502) and Friend (1,027). Statewide, about 22% of Nebraskans live outside of an incorporated community on ranches, farmsteads, and acreages.

1.1.2.4 Land Uses: Land use in the Big Blue River basin is generally devoted to cultivated croplands, with small areas dedicated to grassland and pasture, wetlands, forest and reservoirs. Table 1.1.2.4 and Figure 1.1.2.4a below summarize land use within the Big Blue River Basin in 2007. Active registered wells from the Nebraska Department of Natural Resources (NDNR 2013) are presented in Figure 1.1.2.4b below.

Table 1.1.2.4: 2007 Land use for Big Blue River Basin (USDA 2010)

General Landuse Class	Percent of Watershed	Area in Acres
Cultivated Cropland	77.8%	2,285,421
Forest	2.9%	84,100
Developed/ Roads	4.9%	143,992
Grassland/ Pasture	13.8%	405,406
Wetland	0.3%	8,929
Open Water	0.3%	9,550
Total	100%	2,937,398

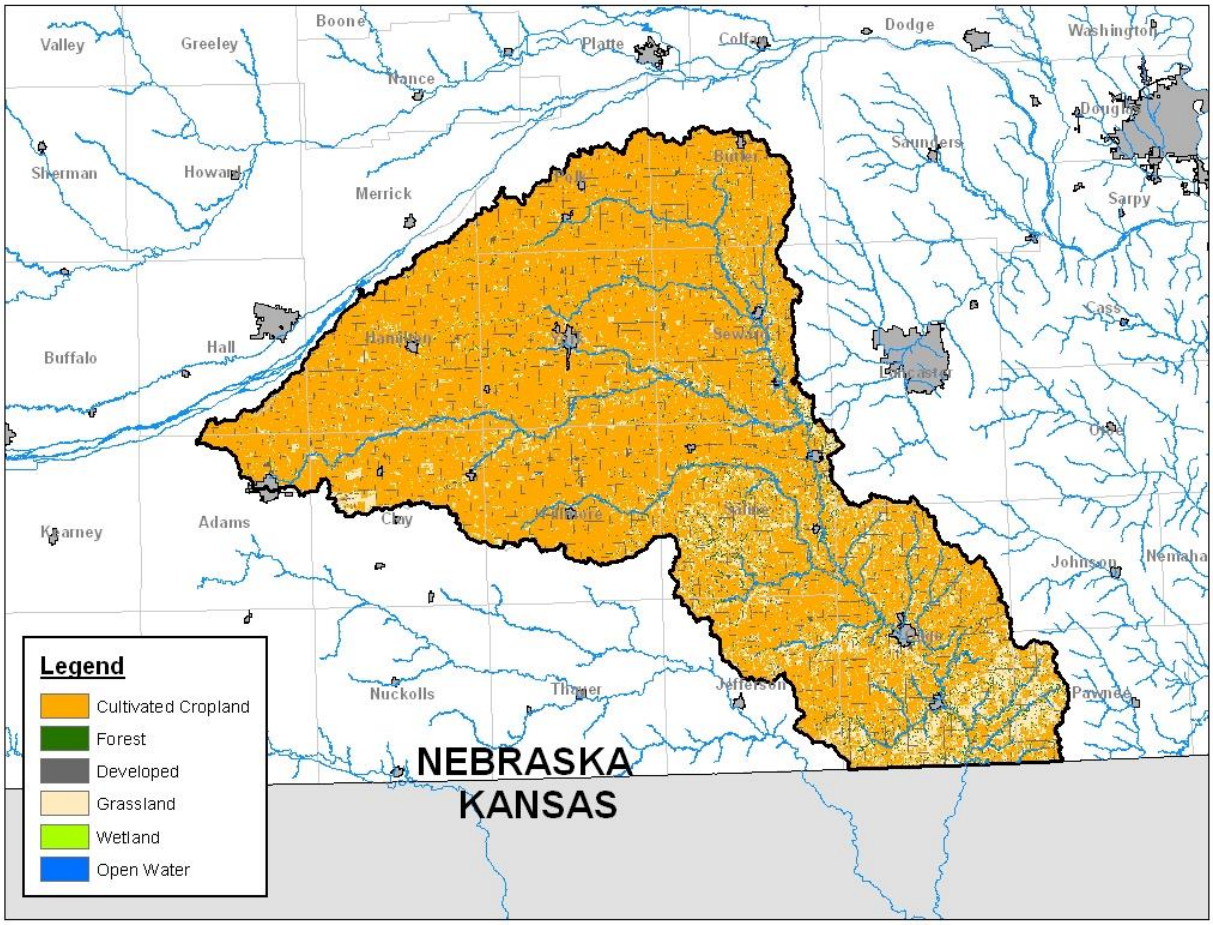

Figure 1.1.2.4a: 2007 Land use in the Big Blue River Basin (USDA 2010)

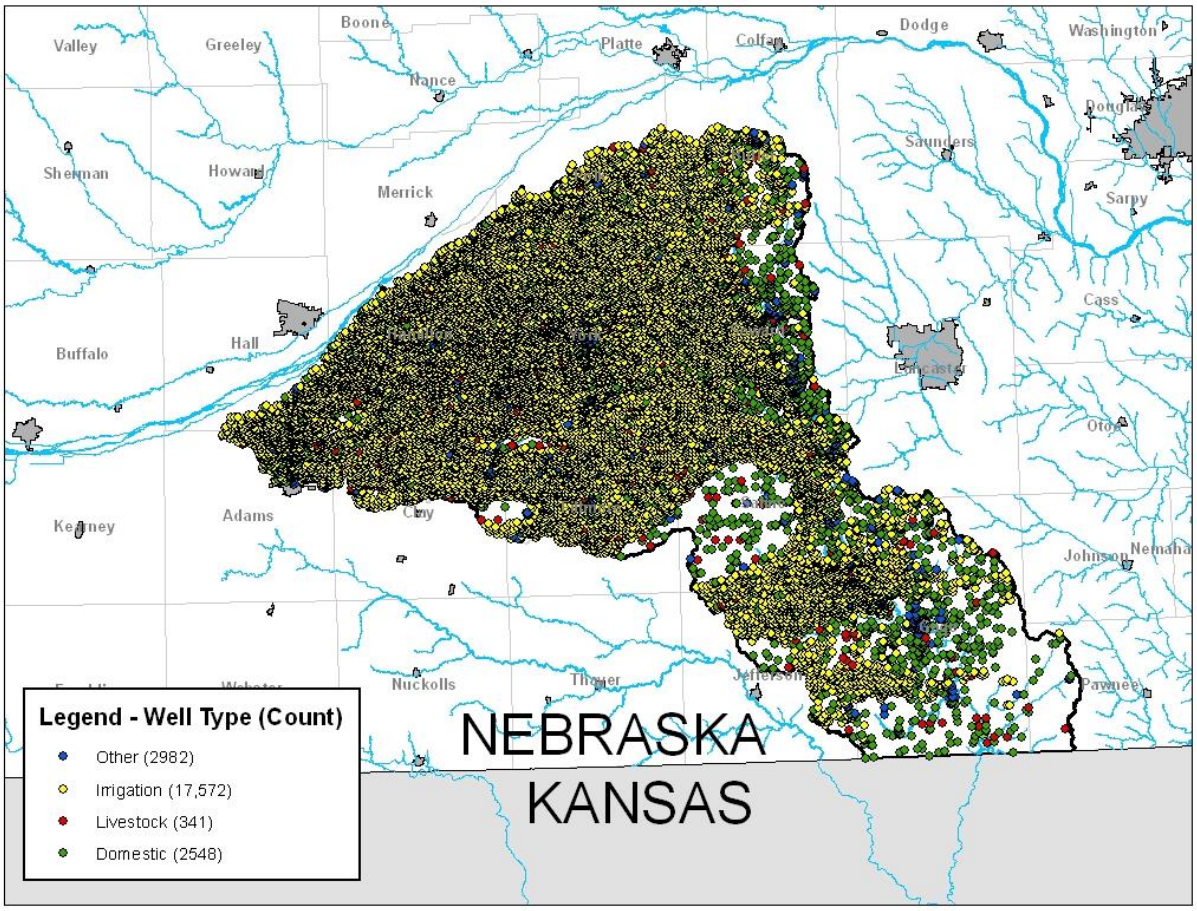

Figure 1.1.2.4b: Registered Wells in the Big Blue River Watershed (NDNR 2013)

1.2 Data Sources

The goal of the TMDL is to quantify pollutant loadings and determine the reductions which would be required to attain water quality standards. In order calculate these loadings, data for flow rate and pollutant concentrations must be known. The sources of data used for the development of this TMDL are outlined below.

1.2.1 Water Quality Data

The Nebraska Department of Environmental Quality monitors surface waters based upon a rotating basin scheme, whereby monitoring is limited to two or three river basins each year with all 13 basins being visited in a six year period. Under the auspice of the rotating basin plan, data was collected from the Big Blue River Basin in 2002 and 2007 and utilized in the development of this TMDL. During basin rotation monitoring samples are collected weekly during the recreation season of May-September.

Several sites within the Big Blue River basin are monitored as part of the Nebraska Ambient Stream Monitoring Network. The intent of these monitoring sites is to monitor and assess long term trends in water quality. As such, data from ambient sites are collected bi-weekly between the months of April and September, and monthly between October and March. Table 1.2.1 outlines the sampling locations for each of the impaired segments discussed in this TMDL. Geographical location of the sites in relation to the impaired streams can be seen in Figure 1.1.2.

Data for Atrazine is collected as part of the Ambient and Basin Monitoring Networks as well as the Joint State Atrazine Big Blur River Monitoring Project (JSABBRMP) (KSU 2004). *E. coli* bacteria data collection is limited basin rotation monitoring. Table 1.2.1 outlines the NDEQ water quality monitoring stations used as data sources for the purposes of this TMDL.

Table 1.2.1: Water Quality Monitoring Locations.

Stream Segment	Site Name	Site Location	Site Type	Water Quality Dates
BB1-10000	SBB1BBLUE110	Big Blue River at Barneston, NE	Ambient	2001-2011
BB1-10100	SBB1MISSN130	Mission Creek near Barneston, NE	Basin Rotation	2007
BB1-10800	SBB1BGIND125	Big Indian at Wymore, NE	Ambient	2001-2010
BB1-10900	JSBBRA13A	Big Indian near Wymore, NE	JSABBRMP	2002-2003
BB1-20000	SBB1BBLUE275	Big Blue River near Crete, NE	Ambient	2002-2010
BB2-10000	SBB2TRKEY110	Turkey Creek near Dewitt, NE	Ambient	2002-2010
BB2-20000	SBB2TRKEY245	Turkey Creek near Wilber, NE	Basin Rotation	2001-2007
BB3-10000	SBB3WFBBR160	West Fork BBR near Dorchester, NE	Ambient	2001-2010
BB3-10300	JSBBRA18	Beaver Creek near Beaver Crossing, NE	JSABBRMP	2001-2003
BB3-20000	SBB3WFBBR204	West Fork BBR near Cordova, NE	Basin Rotation	2007
BB4-10000	SBB4BBLUE165	Big Blue River at Milford, NE	Basin Rotation	2007
BB4-20000	SBB4BBLUE218	Big Blue River at Seward, NE	Basin Rotation	2007
BB4-20800	SBB4LNCLN107	Lincoln Creek near Seward, NE	Ambient	2001-2010
BB4-40000	SBB4BBLUE411	Big Blue River at Surprise, NE	Ambient	2001-2010

*Data for *E. coli* bacteria at all sites was collected as part of Basin Rotation in 2007 only.

1.2.2 Volumetric Flow Rate

Data for flow rate was downloaded from current and historical USGS and Nebraska Department of Natural Resources stream flow gauging stations. In cases where stream flow data was not available for a specific impaired segment, the flow data was estimated using a ratio method based on drainage area.

Furthermore, since the goal of the TMDL is to quantify existing and target pollutant loadings within specific reaches, the entire reach must be considered. Therefore the flow rates used in the calculation of these TMDLs are adjusted to reflect the contributing area at the terminus of each of the impaired segments rather than the area of the gauges themselves. The drainage areas of the segments and gauges were determined using GIS information, and USGS topographical maps. Table 1.2.2 outlines the sites used to obtain or estimate the flow rate data.

Table 1.2.2: Flow Rate Monitoring Locations.

Stream Segment	Gauge Location	DA at Terminus (mi^2)	DA at Gage (mi^2)	Estimated	Ratio	Date Range
BB1-10000	Big Blue River at Barneston	4557.8	4468.4	Yes	1.02	1993-2012
BB1-10100	Est. from Turkey Creek near Wilber	55.0	447.3	Yes	0.13	1994-2010
BB1-10800	Est. from Turkey Creek near Wilber	209.1	447.3	Yes	0.47	1994-2010
BB1-10900	Est. from Turkey Creek near Wilber	144.7	447.3	Yes	0.32	1994-2010
BB1-20000	Big Blue River near Crete	2461.5	2366.8	Yes	1.04	1993-2012
BB2-10000	Turkey Creek near De Witt	728.1	728.1	No		2003-2012
BB2-20000	Turkey Creek near Wilber	462.6	447.3	Yes	1.03	1994-2010
BB3-10000	West Fork Big Blue River near Dorchester, NE	1338.9	1276.6	Yes	1.05	1993-2012
BB3-10300	Est. from West Fork Big Blue River near Dorchester, NE	218.9	1276.6	Yes	0.17	1993-2012
BB3-20000	Est. from West Fork Big Blue River near Dorchester, NE	850.5	1276.6	Yes	0.67	1993-2012
BB4-10000	Est. from Big Blue River at Seward	1352.2	1107.0	Yes	1.22	1995-2010
BB4-20000	Big Blue River at Seward	1338.8	1107.0	Yes	1.21	1995-2010
BB4-20800	Lincoln Creek near Seward, NE	440.2	440.2	No		1995-2010
BB4-40000	Big Blue River at Surprise	383.6	350.6	Yes	1.09	1990-2010

An example of applying the drainage area/ratio approach using information from the above table and the flow rate collected for segment BB3-20000 will be calculated by multiplying the flow rate from the West Fork Big Blue River near Dorchester gage by 0.67.

2.0 Atrazine TMDL

2.1 Problem Identification

The Big Blue River (BB1-10000, BB1-20000, BB4-10000, BB4-40000), Mission Creek (BB1-10100), Big Indian Creek (BB1-10800, BB1-10900), Turkey Creek (BB2-10000, BB2-20000), Beaver Creek (BB3-10300), Lincoln Creek (BB4-20800), and West Fork Big Blue River (BB3-10000, BB3-20000) were listed in the 2010 and 2012 Integrated Reports as having an impaired aquatic life beneficial use with the parameter of concern being Atrazine. This section deals with the extent and nature of the water quality impairments caused by excessive Atrazine in the Big Blue River Basin.

2.1.1 Water Quality Criteria Violated and/or Beneficial Uses Impaired

The Warmwater A - Aquatic Life beneficial use has been deemed impaired within BB1-10000, BB1-10100, BB1-10800, BB1-20000, BB2-10000, BB2-20000, BB3-10000, BB3-20000 and BB4-10000. The Warmwater A Aquatic Life beneficial use applies to surface waters which provide, or could provide, a habitat consisting of sufficient water volume or flow, water quality, and other characteristics such as substrate composition which are capable of maintaining year-round populations of Warmwater biota. Warmwater biota are considered to be life forms in waters where temperatures frequently exceed 25^{o}C. The Atrazine standard for Warmwater class A is 12 (µg/l). (NDEQ 2012).

The Warmeater B – Aquatic Life beneficial use has been deemed impaired within BB1-10900, BB3-10300, BB4-20800 and BB4-40000. The Warmwater B Aquatic Life beneficial use applies to surface waters which provide, or could provide, a habitat only capable of maintain year-round populations of tolerant warmwater biota where key species may be supported on a seasonal or intermittent basis but year-round populations cannot be maintained. The Atrazine standard for Warmwater class B is 12 (µg/l).

2.1.2 Data Sources

Data was collected for Atrazine in the Big Blue River as part of Nebraska's basin rotation, Joint State Atrazine Big Blue River Monitoring Project, and ambient monitoring network as outlined in Section 1.2.

2.1.3 Water Quality Assessment

Water quality data assessments were based upon the beneficial use assessment procedures used to identify Category 5 impaired waters for the 2012 Integrated Report. The procedures are based on the application of the "binomial distribution" method that applies a confidence interval to the exceedance rate in an effort to determine the true exceedance of the waterbody versus the data set. A complete description of the water quality data assessment procedures can be found in the *Methodologies for Waterbody Assessments and Development of the 2012 Integrated Report for Nebraska* (NDEQ 2011).

In the assessment process, all data is initially assessed for seasonal variability in concentration or occurrence. This process is accomplished by creating charts of time-series plots for each parameter of interest. These charts are created from data gathered within the most recent 5-year monitoring period, or where continuous datasets exist (i.e., no more than a 2-year gap in data availability) over longer periods of time. If review of these charts reveals that seasonal differences occur, the NDEQ focuses its assessment efforts within the season(s) where parameter concentrations/occurrences are evident. By examining only the timeframe (seasons) where parameters appear in detectable levels, or at or near levels of concern, a waterbody can be more accurately assessed for use support / impairment. In contrast, when seasonal differences are present, but a long-term database is used to assess beneficial

use support, the impacts to beneficial uses are underestimated and waters where real seasonal concerns exist may be overlooked.

2.1.4 Water Quality Conditions

Atrazine data collected from 2001-2011 were assessed to determine the beneficial use support for both warmwater A and warmwater B aquatic life designations. Table 2.1.4.1 and Figures 2.1.4.1 – 2.1.4.13 present this information.

Table 2.1.4.1: Big Blue River Basin Atrazine Data Assessment

Segment	Beneficial Use Governing Standard	Applicable Standard (µg/l)	Number of Samples	Number of Samples > WQS
BB1-10000	Aquatic Life	12	73	27
BB1-10100	Aquatic Life	12	8	3
BB1-10800	Aquatic Life	12	47	18
BB1-10900	Aquatic Life	12	17	10
BB1-20000	Aquatic Life	12	43	14
BB2-10000	Aquatic Life	12	53	16
BB2-20000	Aquatic Life	12	34	17
BB3-10000	Aquatic Life	12	59	18
BB3-10300	Aquatic Life	12	26	9
BB3-20000	Aquatic Life	12	8	4
BB4-10000	Aquatic Life	12	8	4
BB4-20800	Aquatic Life	12	47	12
BB4-40000	Aquatic Life	12	47	27

* Samples collected during May-June growing season data.

From the data assessment of the segments listed in Table 2.1.4.1, a seasonal impairment (May-June) exists for Atrazine, which coincides with observed periods of increased precipitation and application of the herbicide. Because the impairment is seasonal, the TMDL for these segments will focus on that period.

Table 2.1.4.2 below outlines the Atrazine concentrations by month, from the table it can be seen that the May-June timeframe can be considered as the critical case.

Table 2.1.4.2: Seasonal Consideration of Atrazine Concentrations

Segment		Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
BB1-10000	Avg. Con (ug/l)	0.13	0.23	0.25	1.16	17.72	5.02	1.83	0.72	0.56	0.43	0.26	0.17
	# Above WQS	0	0	0	1	21	6	0	0	0	0	0	0
	# of Samples	8	11	8	33	36	37	36	39	34	8	10	7
BB1-10100	Avg. Con (ug/l)	-	-	-	-	19.31	2.23	0.59	1.17	0.55	-	-	-
	# Above WQS	-	-	-	-	3	0	0	0	0	-	-	-
	# of Samples	-	-	-	-	4	4	4	4	4	-	-	-
BB1-10800	Avg. Con (ug/l)	0.30	0.30	0.46	1.57	16.55	5.26	1.48	0.78	0.95	0.36	0.30	1.00
	# Above WQS	0	0	0	0	15	3	0	0	0	0	0	0
	# of Samples	2	4	4	16	21	26	22	24	20	2	4	2
BB1-10900	Avg. Con (ug/l)	-	0.42	1.40	2.84	20.35	8.08	3.24	1.03	1.28	3.25	2.69	1.03
	# Above WQS	-	0	0	0	9	1	0	0	0	0	0	0
	# of Samples	-	2	3	8	9	8	8	10	8	1	3	2
BB1-20000	Avg. Con (ug/l)	0.13	0.35	0.23	0.42	17.86	7.87	1.64	0.77	0.79	0.30	0.25	0.19
	# Above WQS	0	0	0	0	17	7	0	0	0	0	0	0
	# of Samples	5	8	7	30	33	34	35	37	34	8	10	8
BB2-10000	Avg. Con (ug/l)	0.13	0.22	0.27	4.14	15.82	4.74	1.30	0.48	0.47	0.46	0.26	0.18
	# Above WQS	0	0	0	1	15	1	0	0	0	0	0	0
	# of Samples	4	6	6	24	27	26	27	30	25	6	8	6
BB2-20000	Avg. Con (ug/l)	0.30	0.30	0.35	2.46	21.29	6.43	2.11	0.86	0.78	0.53	0.30	0.30
	# Above WQS	0	0	0	1	14	3	0	0	0	0	0	0
	# of Samples	2	4	4	12	17	17	17	19	16	2	4	2
BB3-10000	Avg. Con (ug/l)	0.34	0.20	0.23	0.39	19.68	5.08	1.73	0.86	0.39	0.24	0.21	0.19
	# Above WQS	0	0	0	0	15	3	0	0	0	0	0	0
	# of Samples	6	7	7	28	30	30	32	33	29	7	9	7
BB3-10300	Avg. Con (ug/l)	0.30	0.30	0.38	0.73	16.75	5.26	2.20	0.88	0.39	0.30	0.30	0.30
	# Above WQS	0	0	0	0	6	3	0	0	0	0	0	0
	# of Samples	2	4	4	12	13	13	12	15	12	2	4	2
BB3-20000	Avg. Con (ug/l)	-	-	-	-	19.50	24.20	26.10	25.60	19.80	-	-	-
	# Above WQS	-	-	-	-	4	4	4	4	3	-	-	-
	# of Samples	-	-	-	-	4	4	4	4	3	-	-	-
BB4-10000	Avg. Con (ug/l)	-	-	-	-	20.10	24.30	27.10	26.80	20.00	-	-	-
	# Above WQS	-	-	-	-	4	4	4	4	3	-	-	-
	# of Samples	-	-	-	-	4	4	4	4	3	-	-	-
BB4-20800	Avg. Con (ug/l)	0.31	0.17	0.19	1.07	11.94	8.66	1.61	1.03	0.40	0.11	0.09	0.07
	# Above WQS	0	0	0	0	8	4	0	0	0	0	0	0
	# of Samples	6	7	8	24	22	23	26	25	23	7	9	7
BB4-40000	Avg. Con (ug/l)	0.39	0.37	0.46	1.36	24.34	24.33	2.87	0.99	0.67	0.93	0.78	0.69
	# Above WQS	0	0	0	1	13	13	0	0	0	0	0	0
	# of Samples	6	7	8	25	23	24	27	26	24	7	9	7

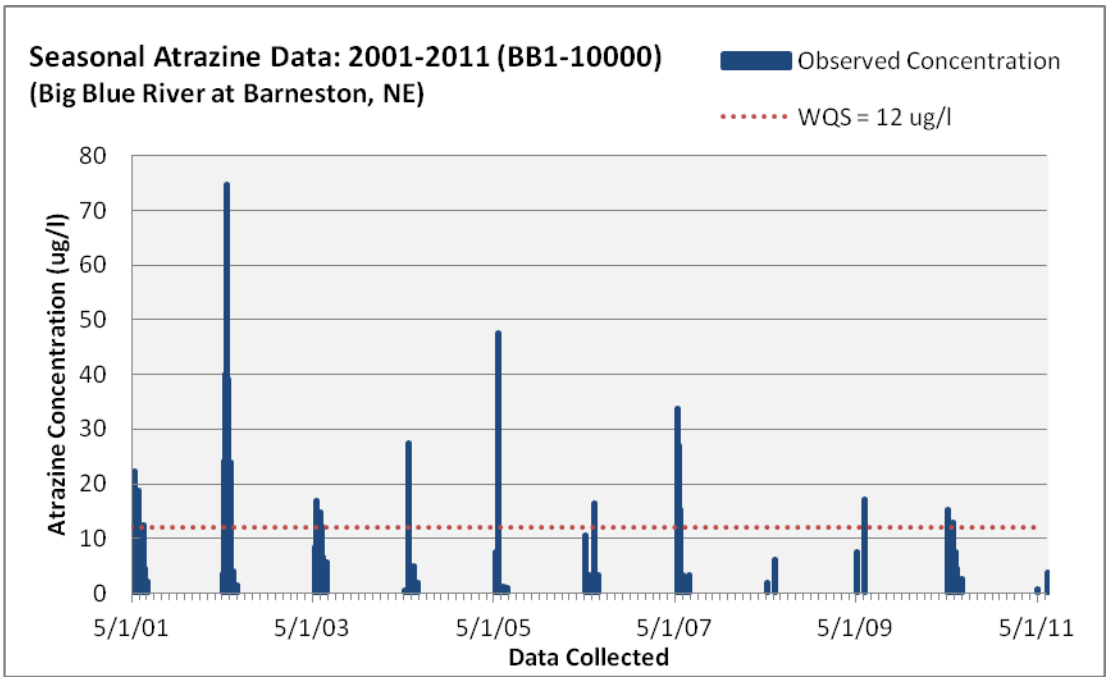

Figure 2.1.4.1: Big Blue River (BB1-10000) Atrazine Data 2001-2011

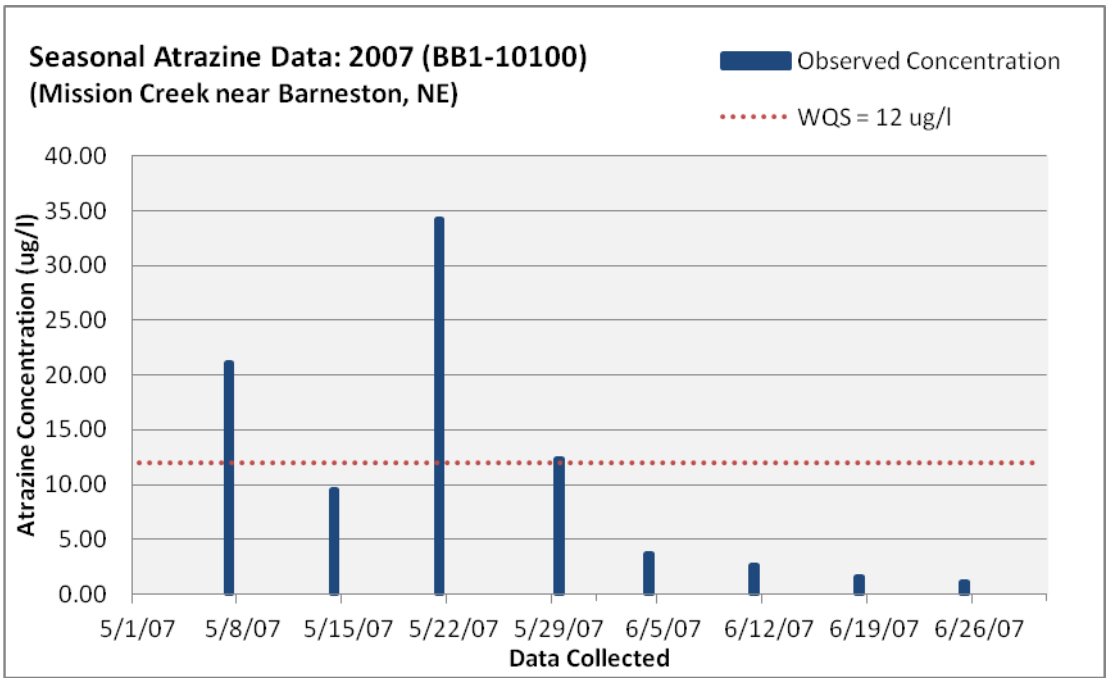

Figure 2.1.4.2: Seasonal Mission Creek (BB1-10100) Atrazine Data 2007

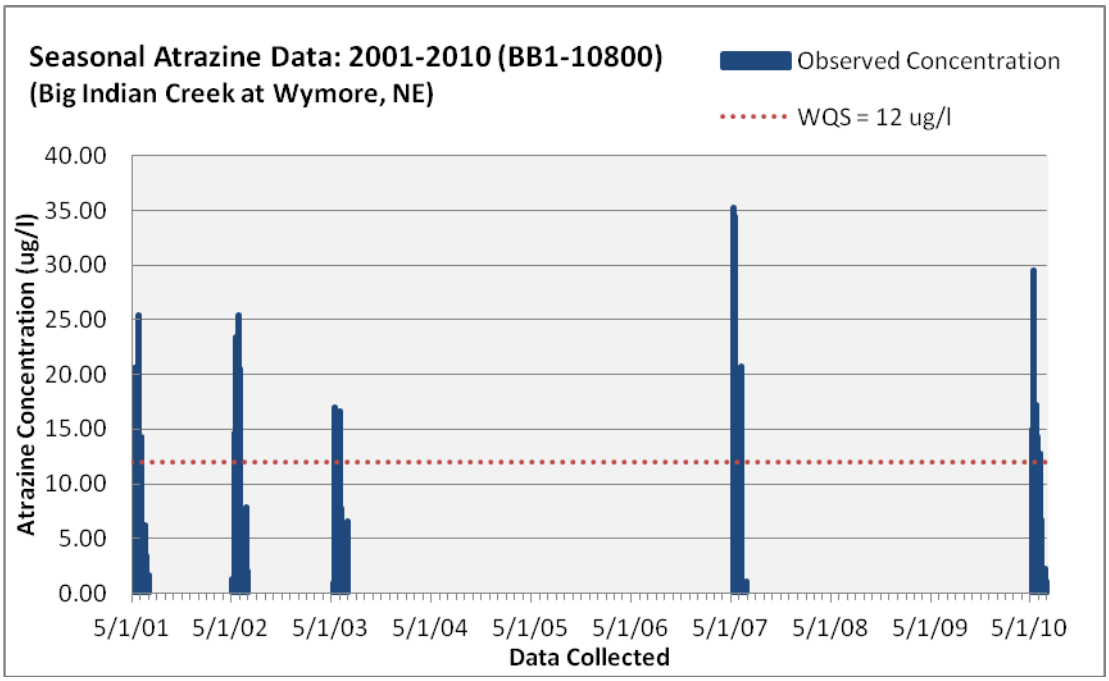

Figure 2.1.4.3: Seasonal Big Indian Creek (BB1-10800) Atrazine Data 2001-2010

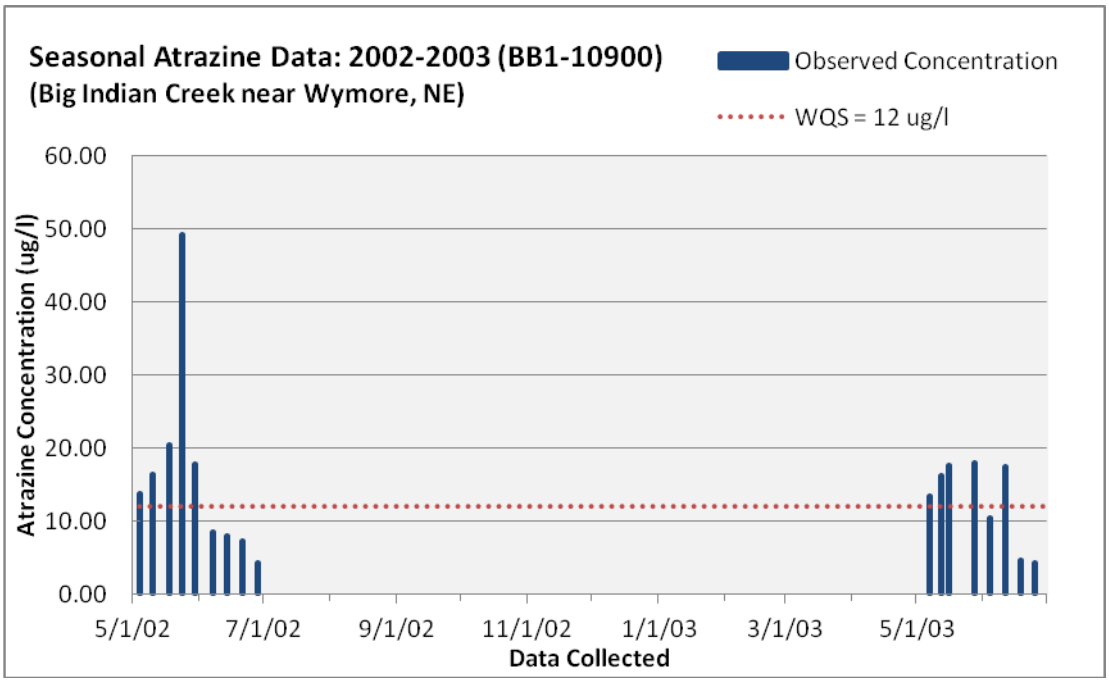

Figure 2.1.4.4: Seasonal Big Indian Creek (BB1-10900) Atrazine Data 2002-2003

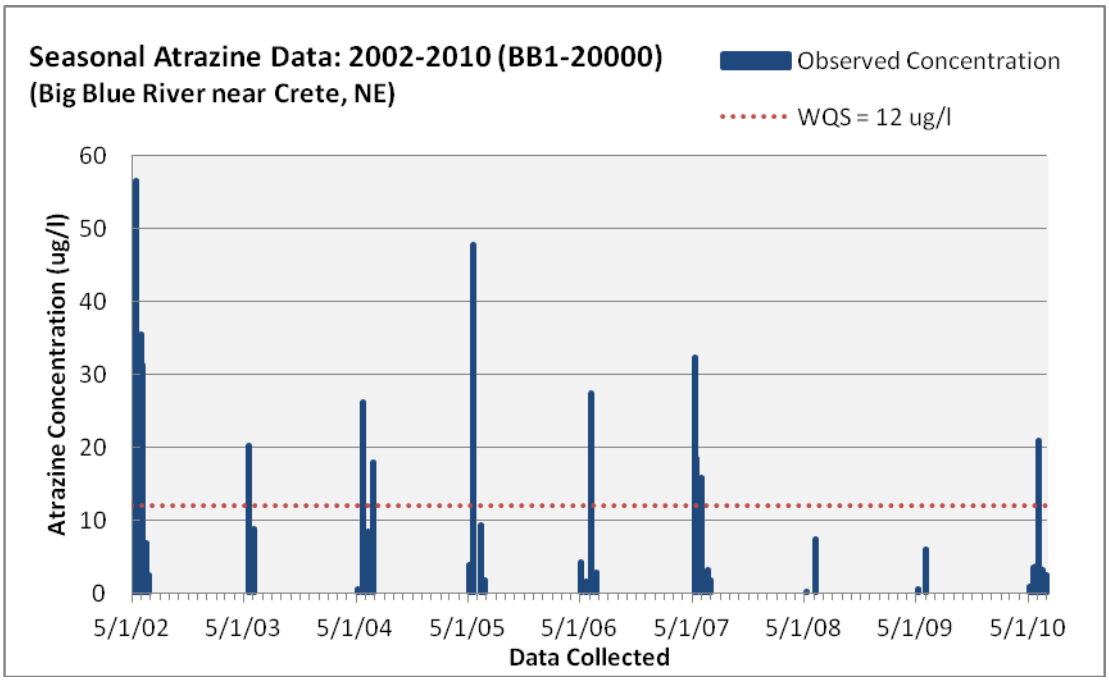

Figure 2.1.4.5: Seasonal Big Blue River (BB1-20000) Atrazine Data 2002-2010

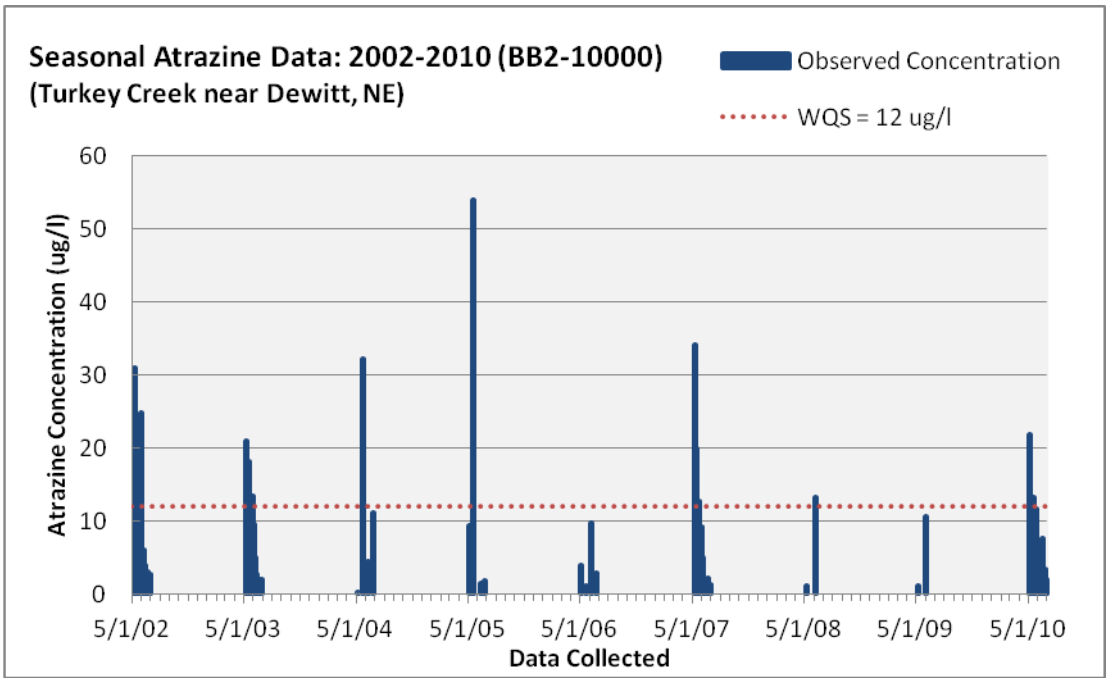

Figure 2.1.4.6: Seasonal Turkey Creek (BB2-10000) Atrazine Data 2002-2010

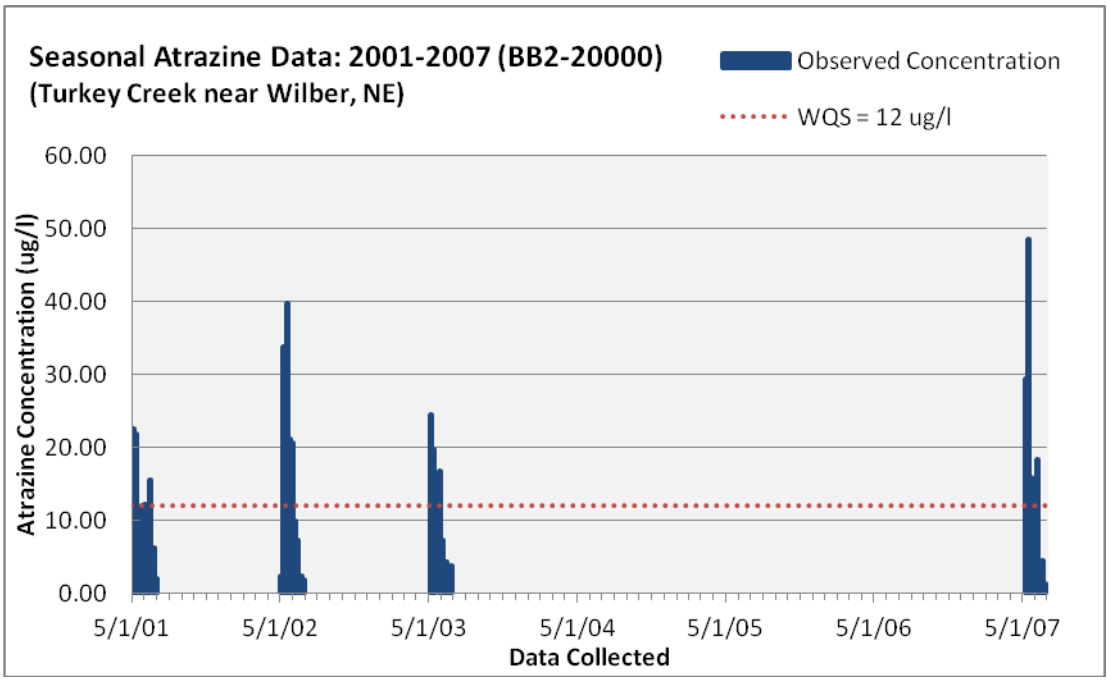

Figure 2.1.4.7: Seasonal Turkey Creek (BB2-20000) Atrazine Data 2001- 2007

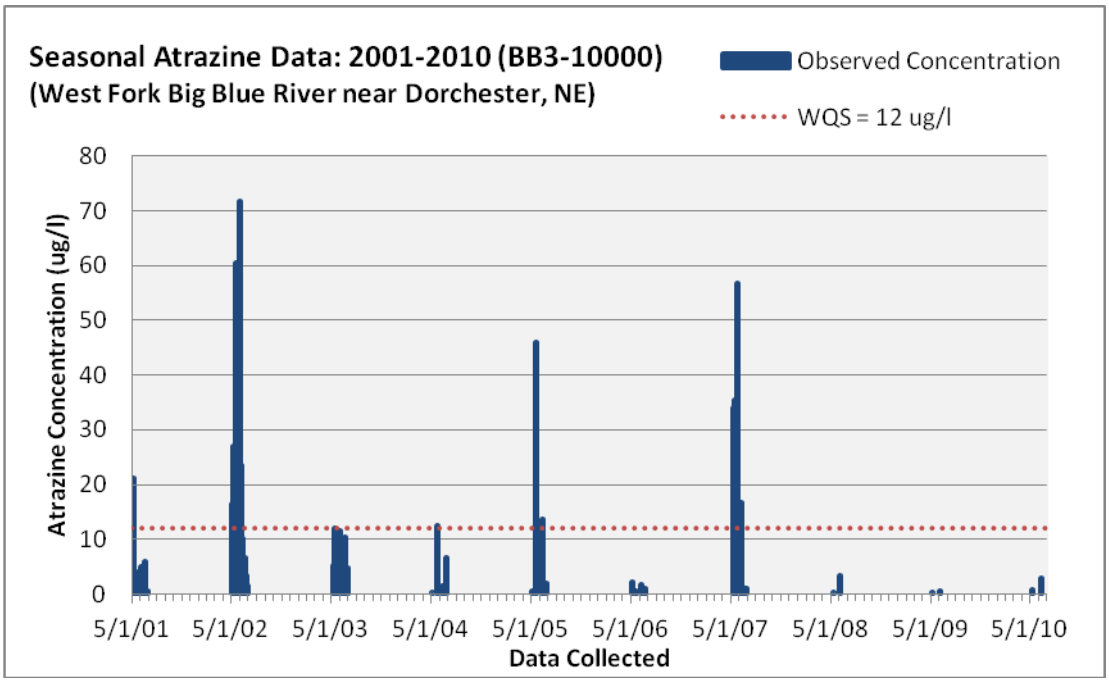

Figure 2.1.4.8: Seasonal West Fork Big Blue River (BB3-10000) Atrazine Data 2001-2010

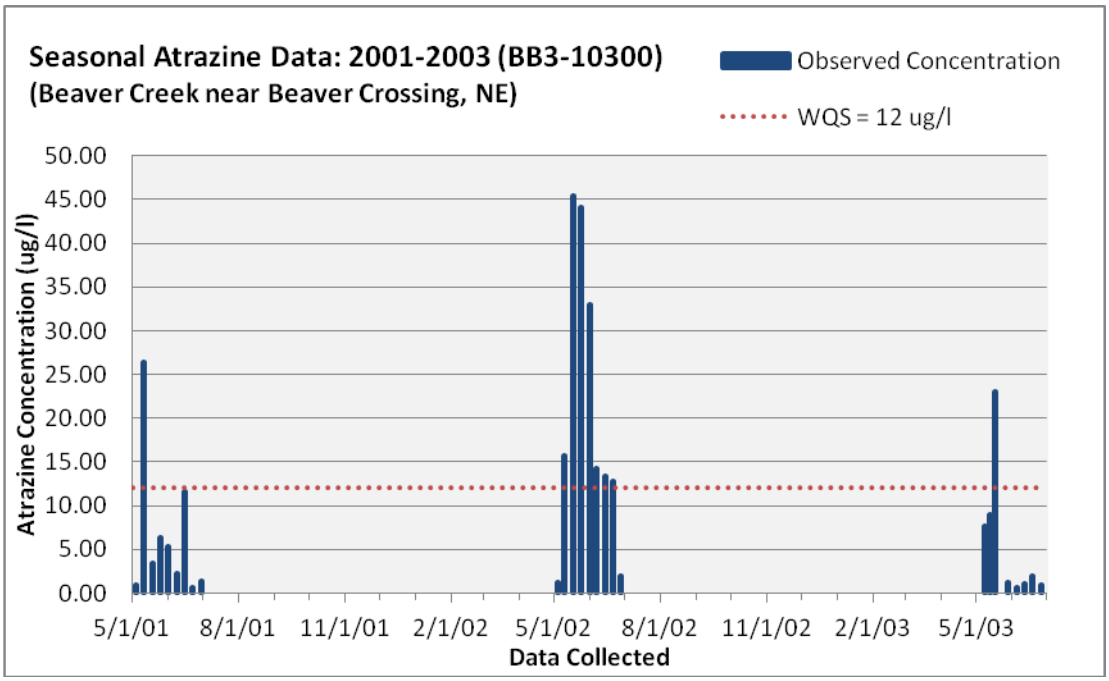

Figure 2.1.4.9: Seasonal Beaver Creek (BB3-10300) Atrazine Data 2001-2003

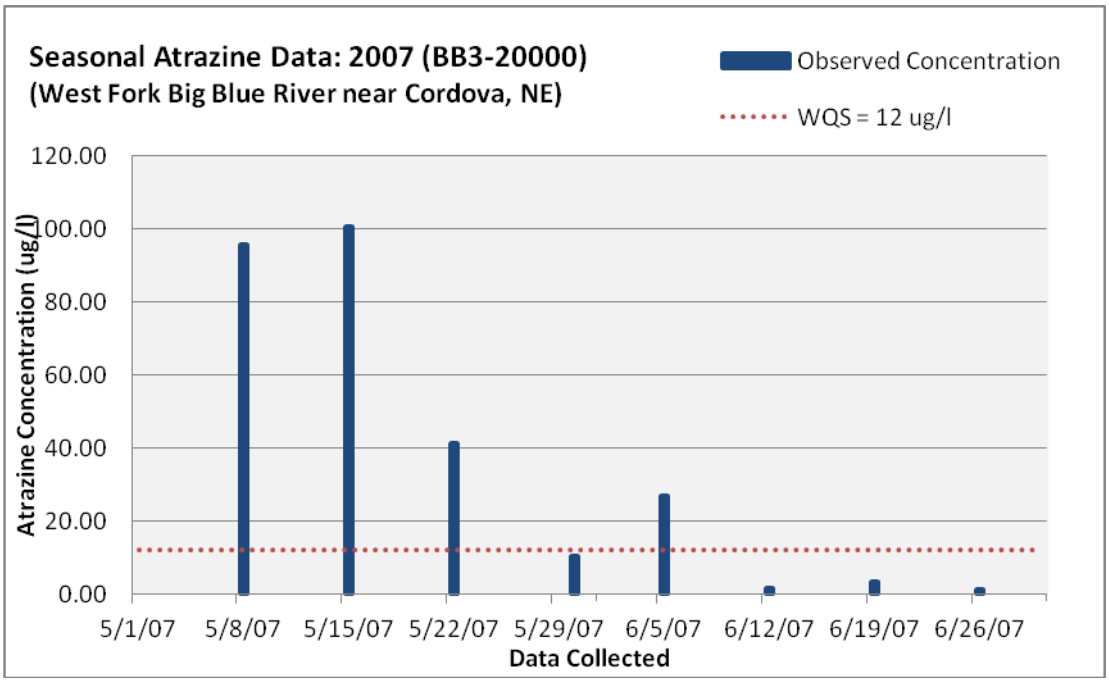

Figure 2.1.4.10: Seasonal West Fork Big Blue River (BB3-20000) Atrazine Data 2007

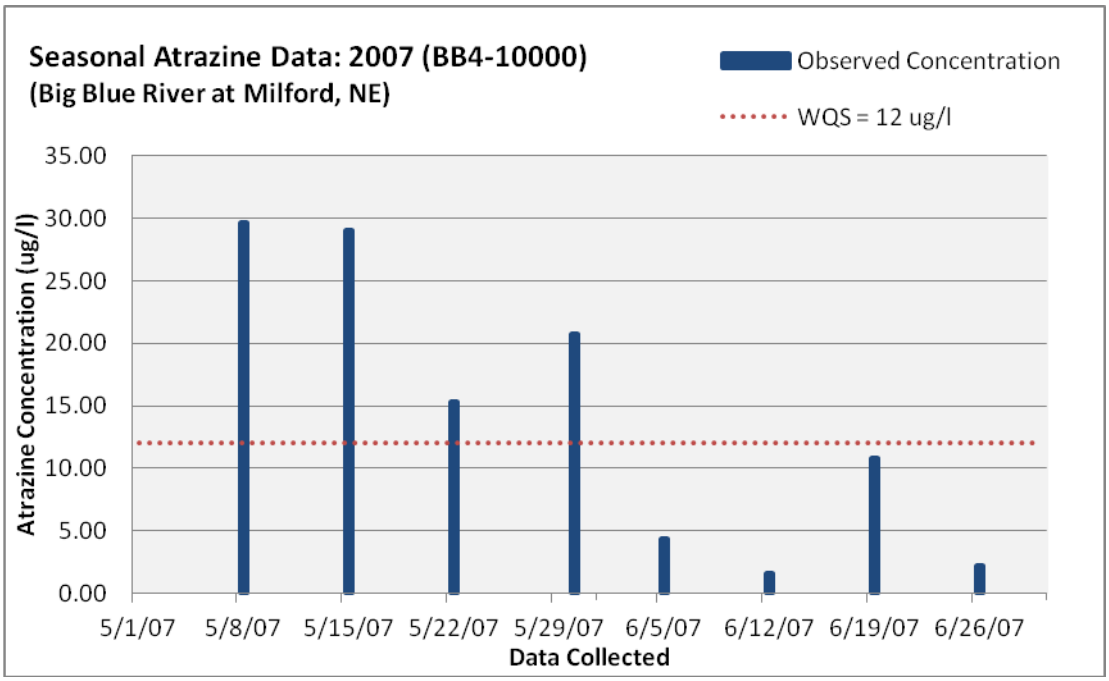

Figure 2.1.4.11: Seasonal Big Blue River (BB4-10000) Atrazine Data 2007

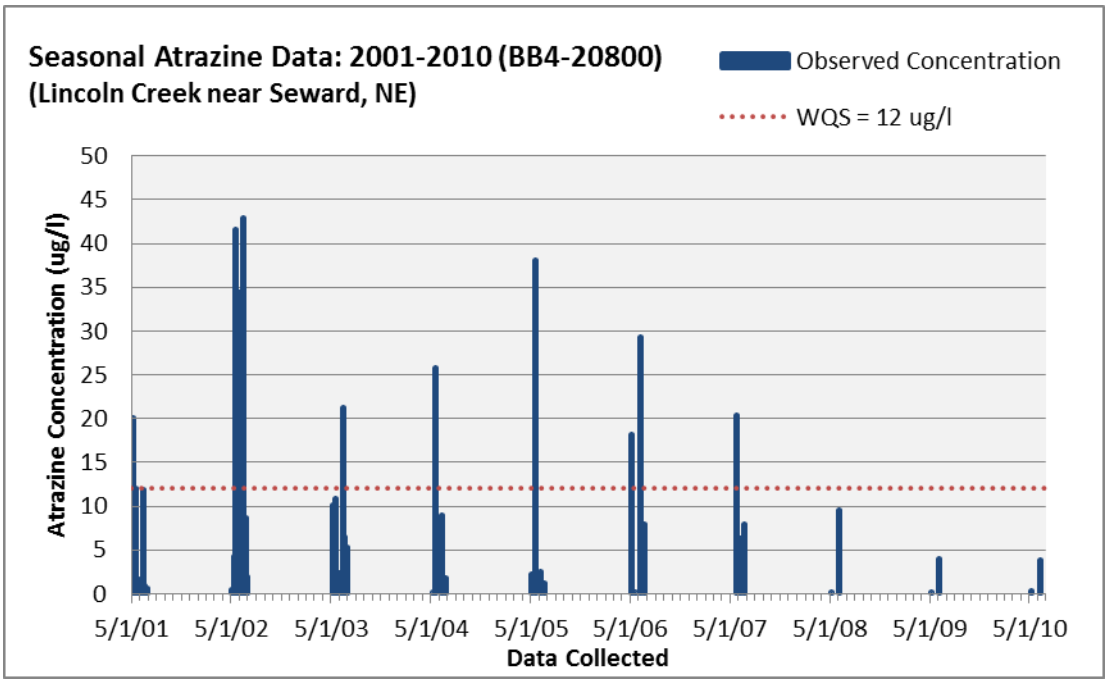

Figure 2.1.4.12: Seasonal Lincoln Creek (BB4-20800) Atrazine Data 2001-2010

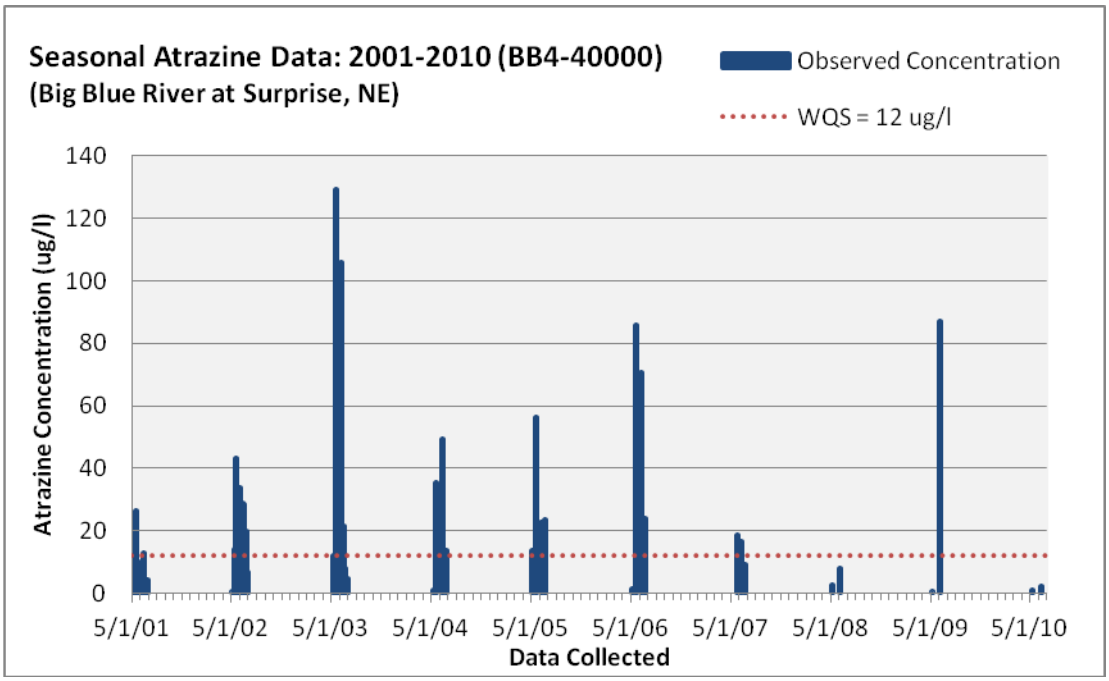

Figure 2.1.4.13: Seasonal Big Blue River (BB4-40000) Atrazine Data 2001-2010

2.1.5 Potential Pollutant Sources

Atrazine is a triazine herbicide currently registered for use against broadleaf and some grassy weeds. Atrazine is registered for use on corn (field and sweet); sorghum; range grasses for the establishment of permanent grass cover on rangelands and pastures under USDA's Conservation Reserve Program (CRP) in OK, NE, TX, and OR; wheat (where application is to wheat stubble on fallow land following wheat harvests; wheat is not the target crop); conifer forests; Christmas tree farms; sod farms; and golf courses (EPA 2006).

Atrazine is one of the most heavily used pesticides in North America (EPA 2003). Given this usage and source, point and natural sources are likely not contributing Atrazine to surface waters in Nebraska. Therefore, for this TMDL the entire load will be considered the result of nonpoint source discharges.

2.2 TMDL Endpoint

In Nebraska, Atrazine criteria apply to any stream segment assigned an Aquatic Life, or Public Drinking Water Supply beneficial use. According to the current stream use designations from Title 117 (NDEQ 2012) there are no segments in the Big Blue River basin which are assigned the Public Drinking Water supply beneficial use. Therefore the endpoint for these TMDLs will be based on the numeric criteria associated with the standard associated with the aquatic life beneficial use of 12 µg/L.

2.2.1 Numeric Water Quality Criteria

Water quality criteria established for both Class A and B – Warmwater Aquatic Life protection of the beneficial use can be found in Title 117, Chapter 4 (NDEQ 2011). Assessment of the data and the TMDL are based on the chronic criterion of 12 µg/l for Aquatic Life.

2.2.2 Selection of Critical Environmental Conditions

The critical environmental conditions for this TMDL have been identified in the assessment process. Specifically, the data and information for Atrazine was limited to the May-June timeframe when the deviations from the water quality criteria were observed.

2.2.3 Waterbody Pollutant Loading Capacity

Defining waterbody pollutant loading capacity implies a steady state. This TMDL recognizes that loadings are dynamic and can vary with stream flow. As well, the above section indicates a potentially wide range of environmental conditions that must be accounted for.

The method chosen to account for the variation in flow is based upon the load duration curve (NDEQ 2002). TMDL curves are initiated by the development of a stream's hydrograph using the long-term gauge information. The flow information (curve) is then translated into a load curve by multiplying the flow values by the water quality standard (WQS) and a conversion factor (C). The acceptable "load" is then plotted graphically. Appendix B provides a table with the 0-100th percentile flow values and associated daily load values for the impaired segments.

Therefore, the loading capacity for each of the segments will be defined by:

$$\text{Loading Capacity} = \text{Flow} \times \text{WQS} \times C$$

2.3 Pollution Source Assessment

As indicated in Section 2.1.5, the only source of Atrazine considered for this TMDL is nonpoint sources. Although the source has been determined, it is important to illustrate the existing conditions.

2.3.1 Existing Pollutant Conditions

The existing pollutant conditions are shown in the following TMDL curves (Figures 2.3.1.1-2.3.1.13). Points plotted above the acceptable loading indicate a deviance from the water quality criteria. Data for flow rate and Atrazine concentrations were obtained as outlined in Section 2.1.4.

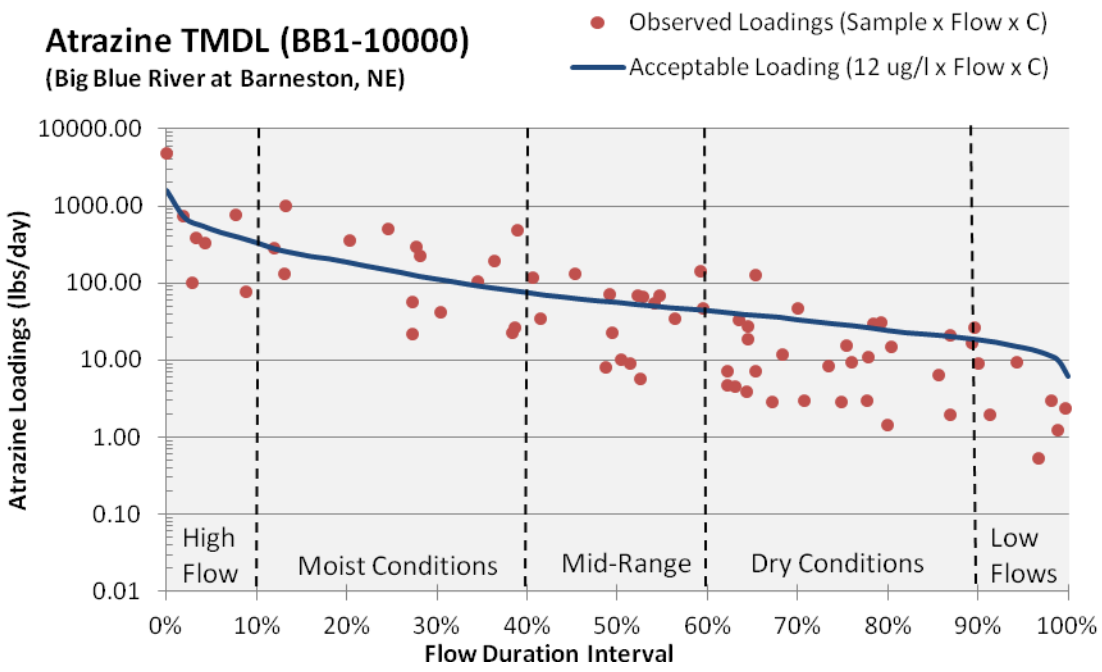

Figure 2.3.1.1: Atrazine TMDL Curve for Big Blue River (BB1-10000) at SBB1BBLUE110

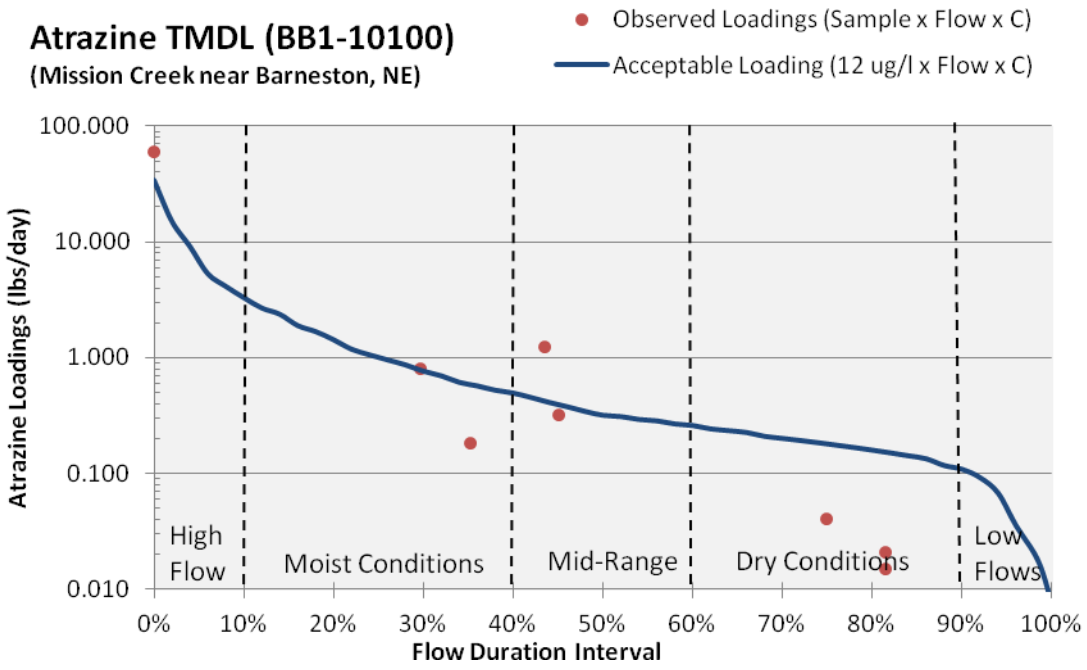

Figure 2.3.1.2: Seasonal Atrazine TMDL Curve for Mission Creek (BB1-10100) at SBB1MISSN130

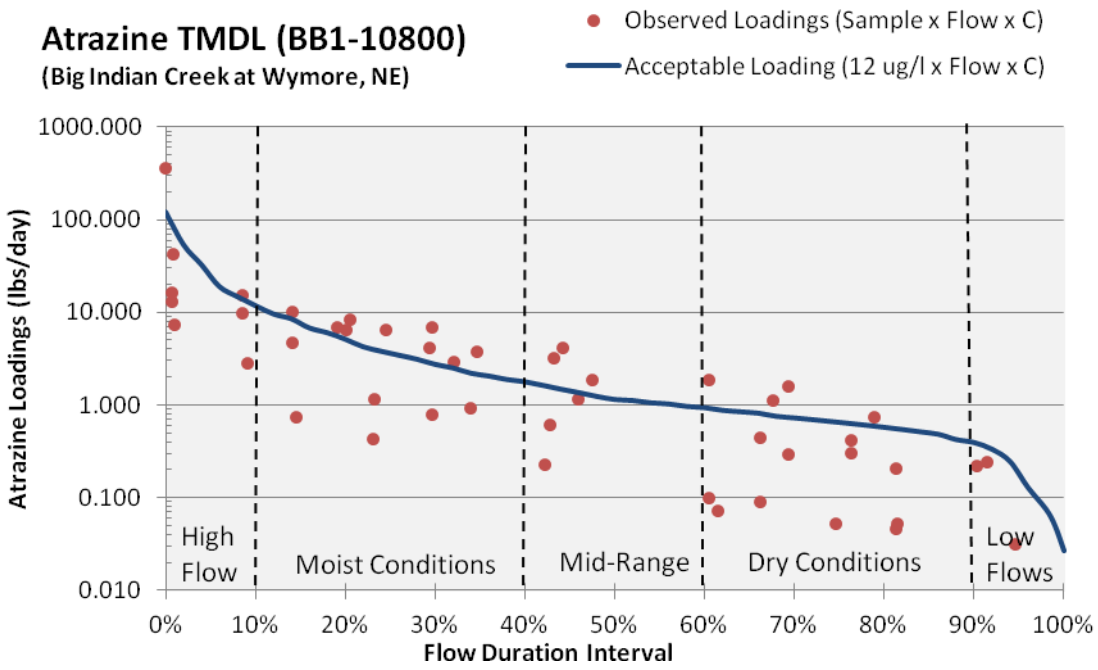

Figure 2.3.1.3: Seasonal Atrazine TMDL Curve for Big Indian Creek (BB1-10800) at SBB1BGIND125

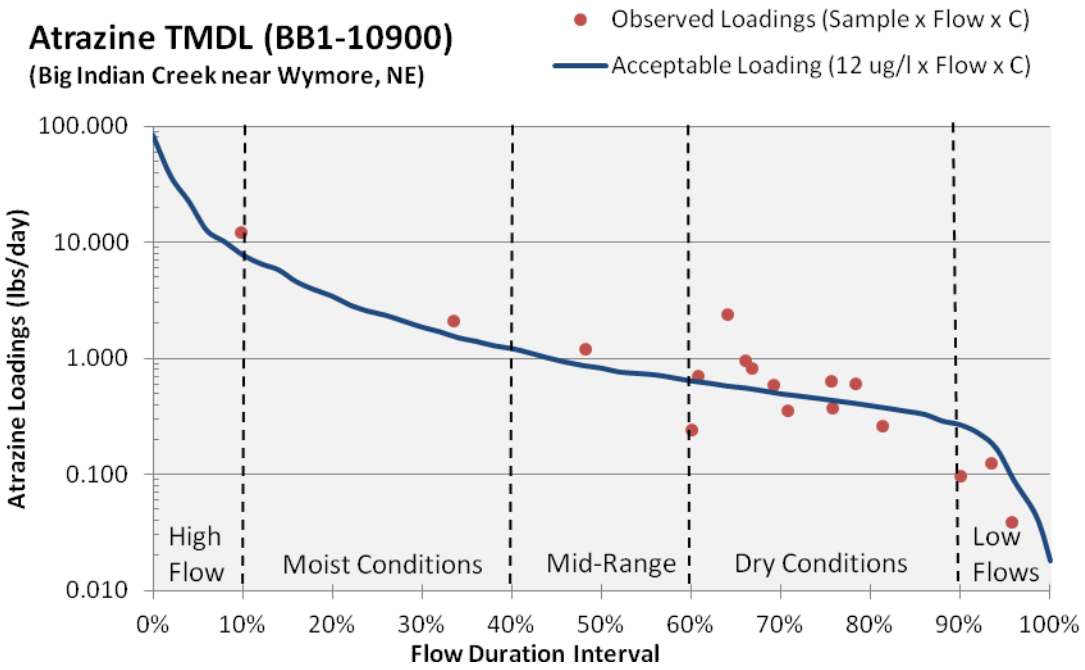

Figure 2.3.1.4: Seasonal Atrazine TMDL Curve for Big Indian Creek (BB1-10900) at JSBBRA13A

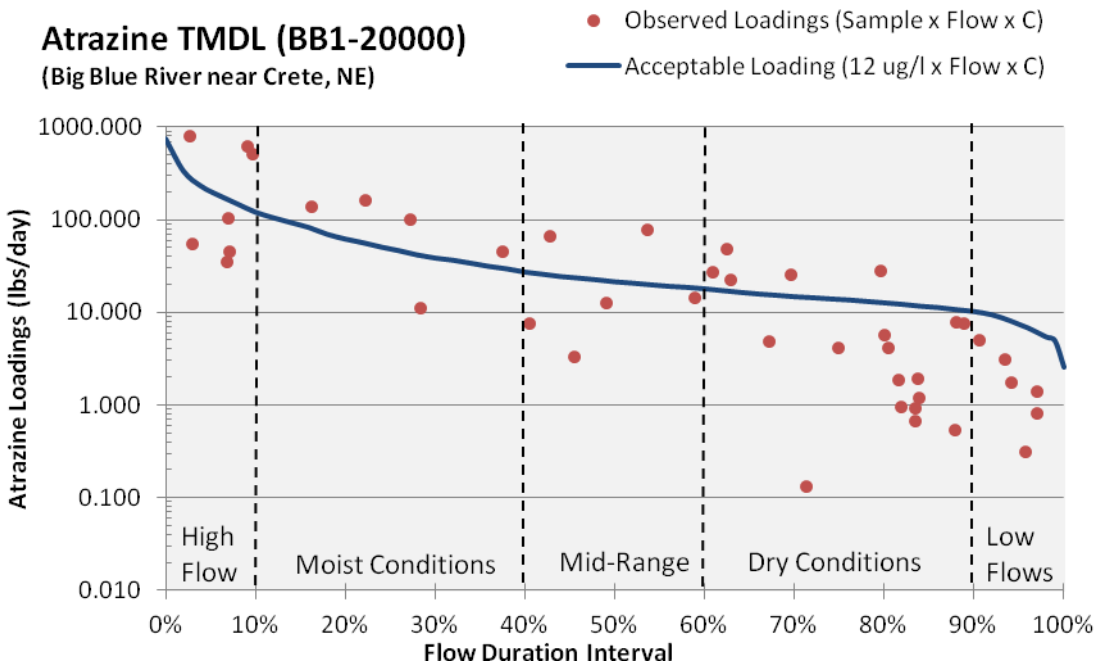

Figure 2.3.1.5: Seasonal Atrazine TMDL Curve for Big Blue River (BB1-20000) at SBB1BBLUE275

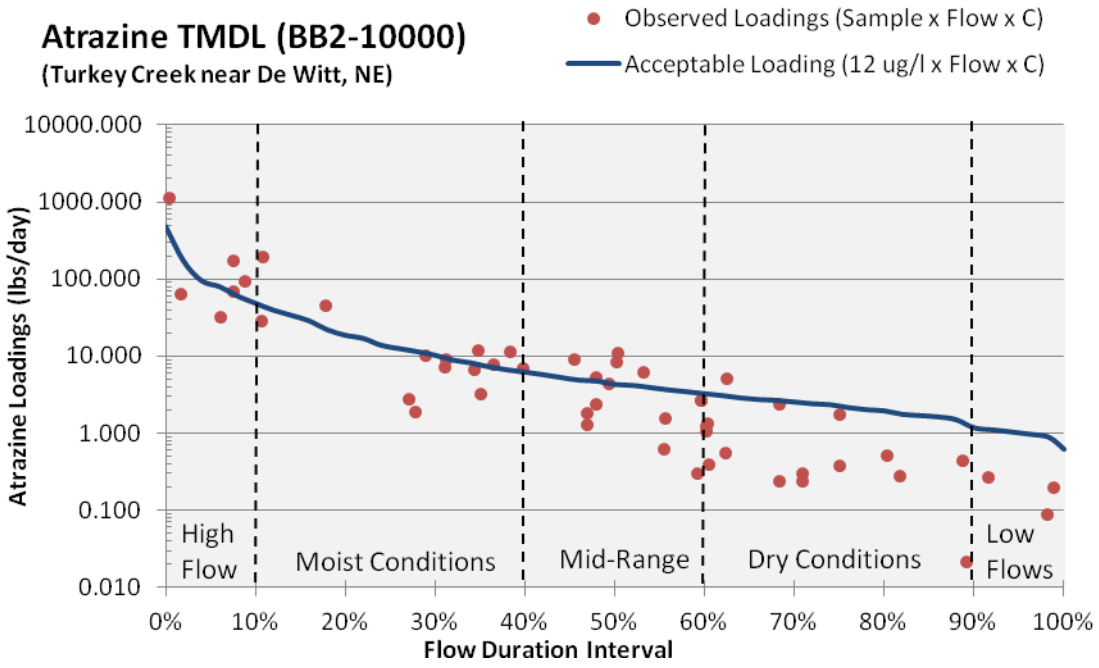

Figure 2.3.1.6: Seasonal Atrazine TMDL Curve for Turkey Creek (BB2-10000) at SBB2TRKEY110

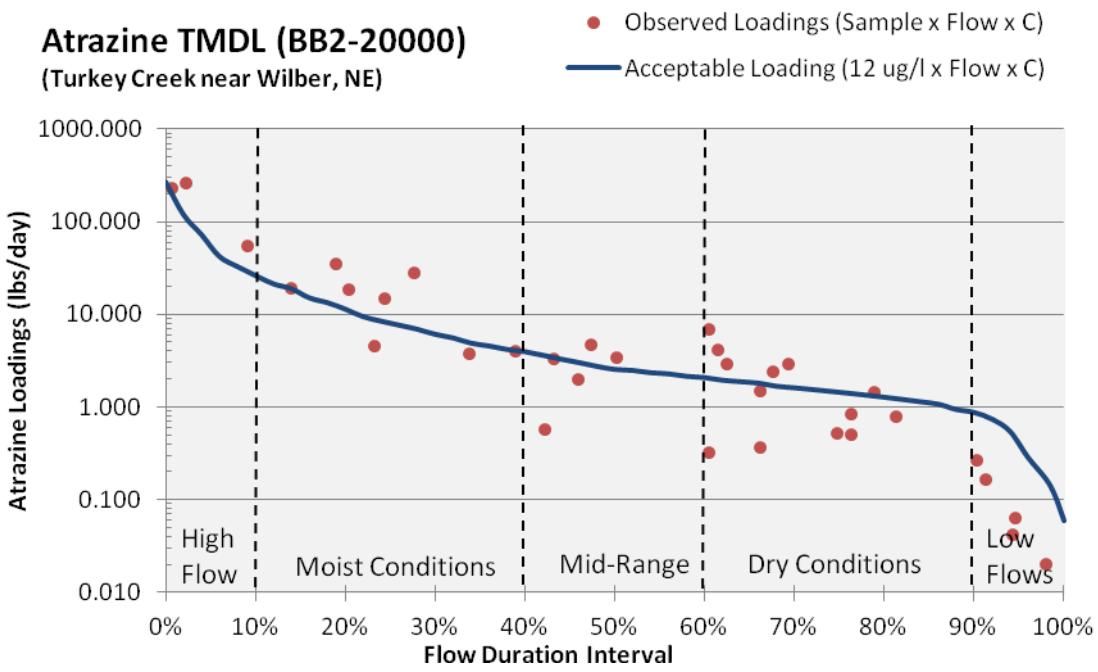

Figure 2.3.1.7: Seasonal Atrazine TMDL Curve for Turkey Creek (BB2-20000) at SBB2TRKEY245

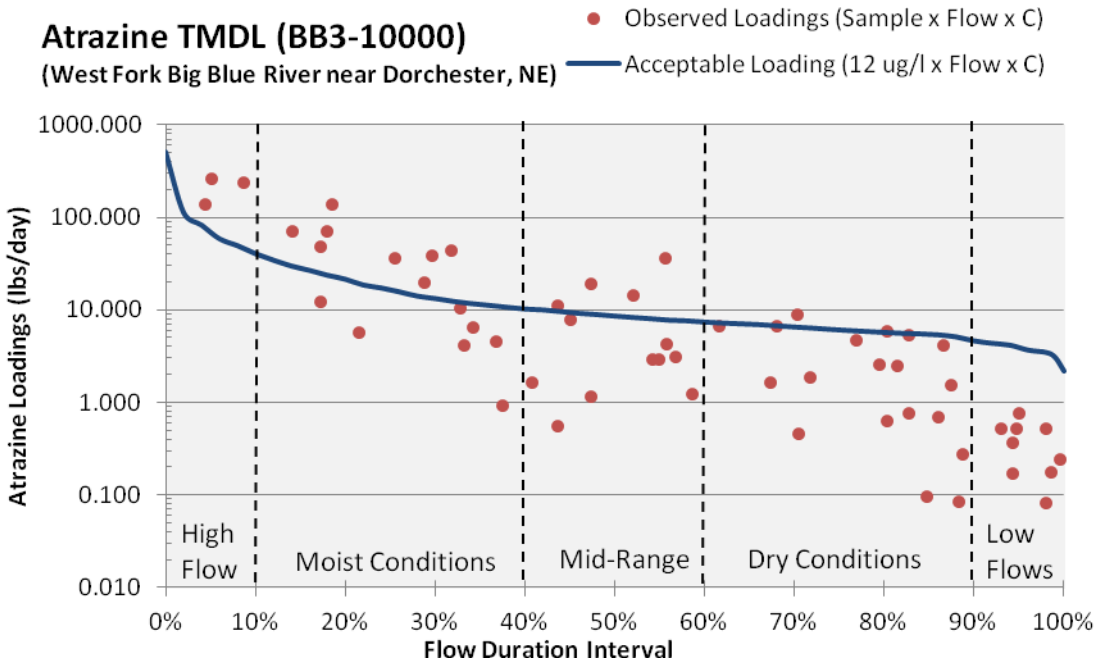

Figure 2.3.1.8: Seasonal Atrazine TMDL Curve for West Fork BBR (BB3-10000) at SBB3WFBBR160

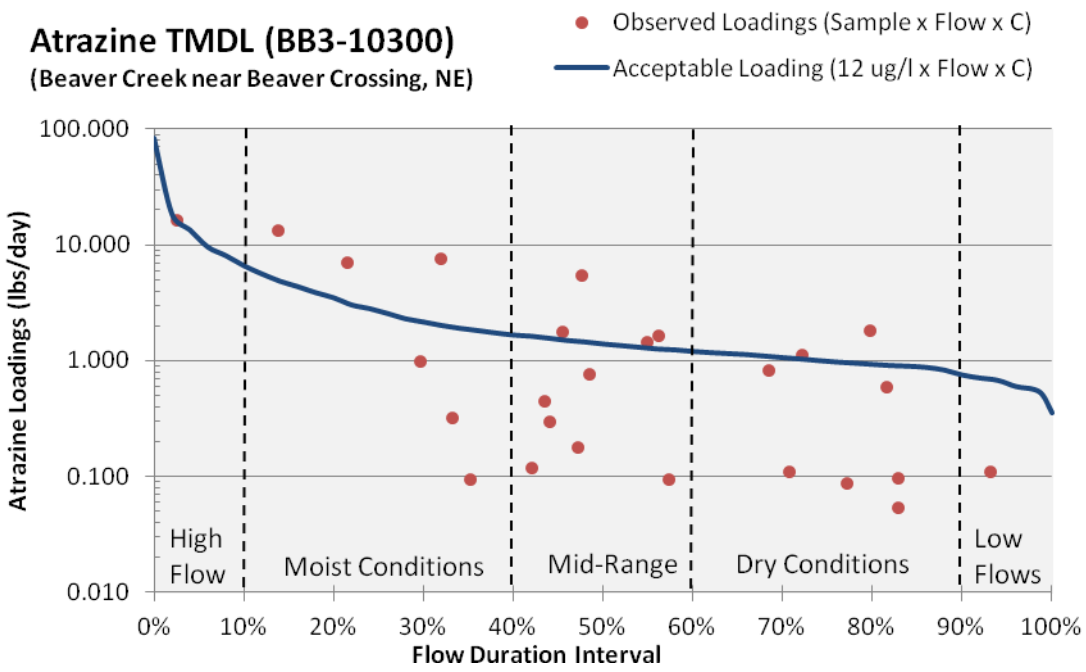

Figure 2.3.1.9: Seasonal Atrazine TMDL Curve for Beaver Creek (BB3-10300) at JSBBRA18

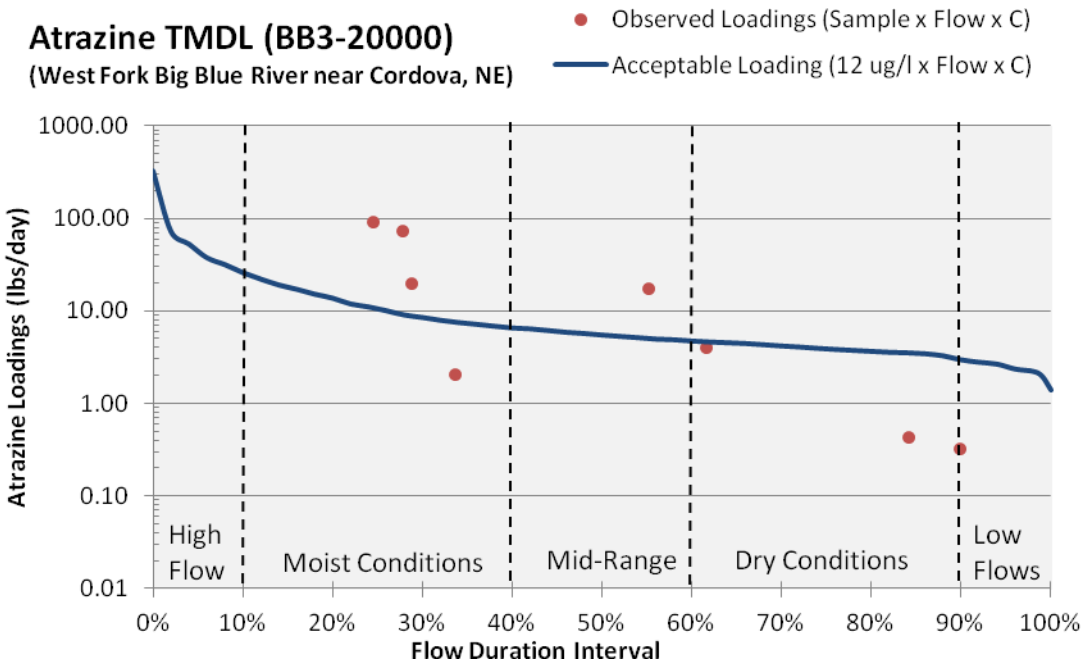

Figure 2.3.1.10: Seasonal Atrazine TMDL Curve for West Fork BBR (BB3-20000) at SBB3WFBBR204

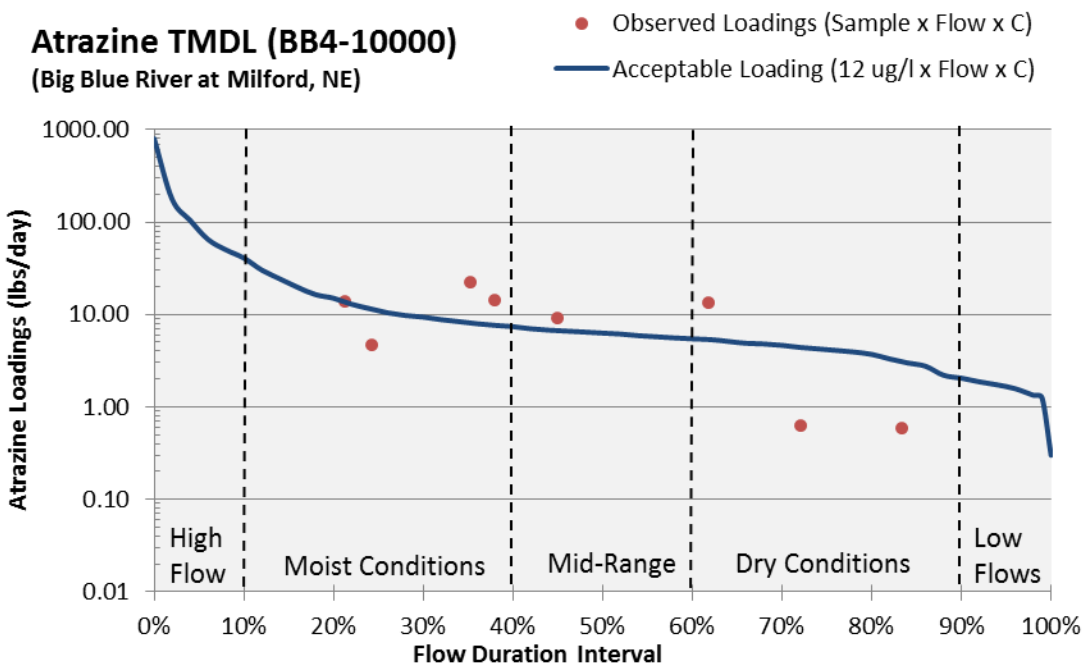

Figure 2.3.1.11: Seasonal Atrazine TMDL Curve for Big Blue River (BB4-10000) at SBB4BBLUE165

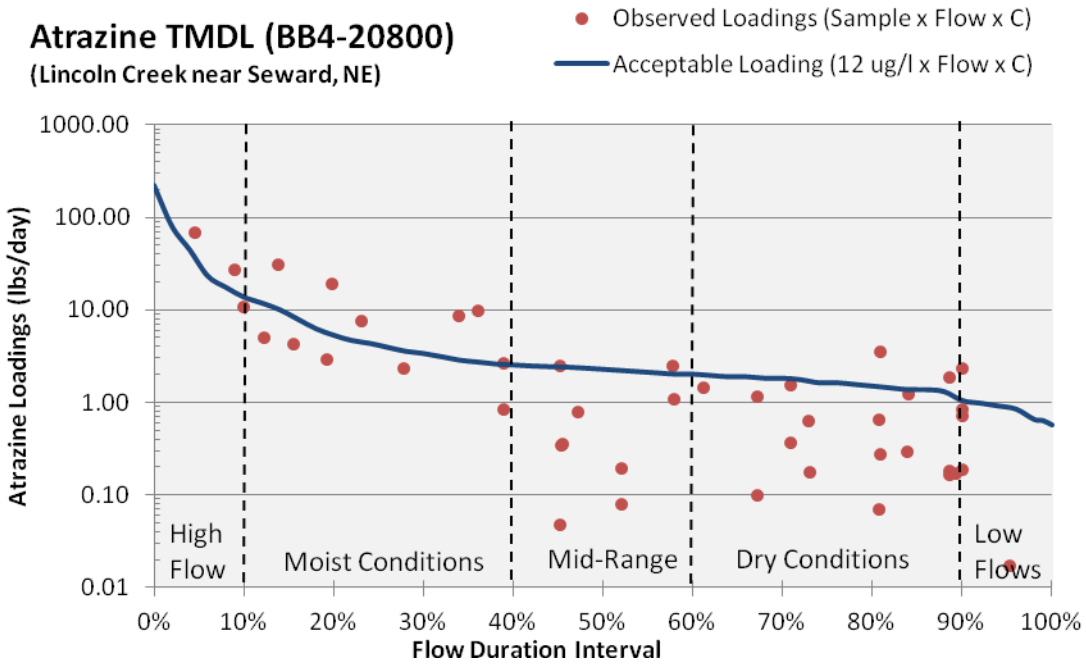

Figure 2.3.1.12: Seasonal Atrazine TMDL Curve for Lincoln Creek (BB4-20800) at SBB4LNCLN107

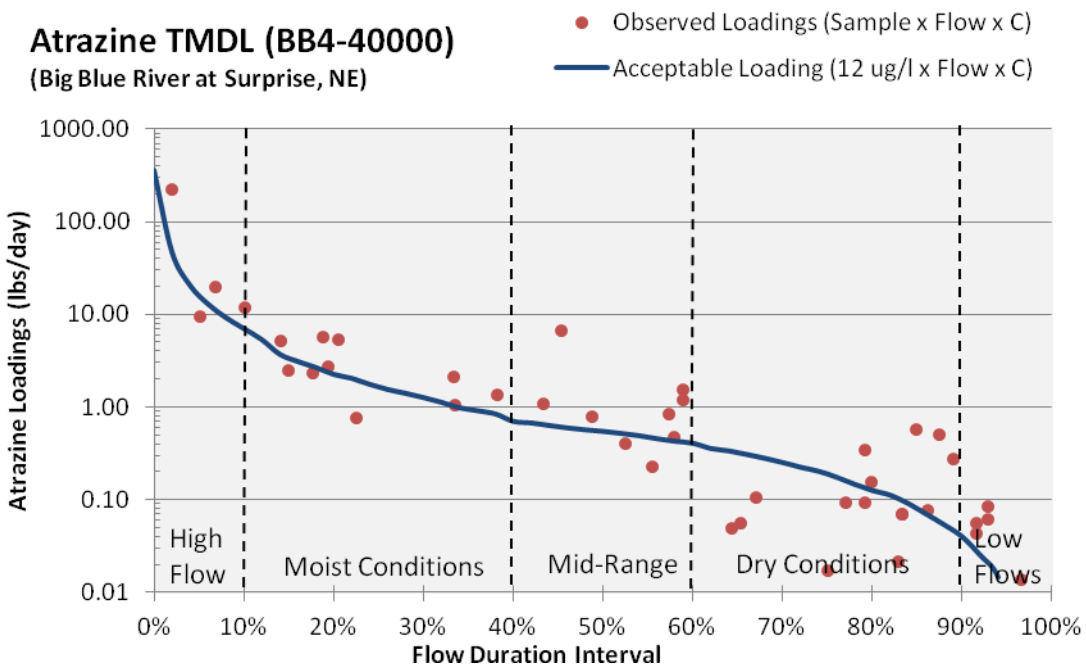

Figure 2.3.1.13: Seasonal Atrazine TMDL Curve for Big Blue River (BB4-40000) at SBB4BBLUE411

2.4 Pollutant Allocation

A TMDL is defined as:

TMDL = Loading Capacity = WLA + LA + Background + MOS

As stated above, the loading capacity is based upon flow position in the hydrograph and is defined by:

Loading Capacity = Flow x WQS x C

Where:

Flow = cfs = Stream flow volume as cubic feet per second
WQS = 12 µg/l = Water quality criteria for Atrazine in micrograms/liter (µg/l) from Title 117
C = 0.005382466 = constant used to convert cfs times µg/l to lbs/day

2.4.1 Wasteload Allocation

As stated previously, elevated Atrazine concentrations are typically not the result of point source discharges. For this TMDL the wasteload allocation (WLA) will be zero (0).

2.4.2 Natural Background

Atrazine does not occur naturally in the environment therefore the allocation for natural background will be zero (0).

2.4.3 Load Allocation

The load allocations (LA) assigned to this TMDL will be based upon the stream flow volume and will be defined as:

$$LA_i = Q_i \times (12\ \mu g/l) \times C$$

Where:
LA_i = load allocations at the i^{th} flow
Q_i = stream flow at the i^{th} flow
12 μg/l = applicable/target water quality criteria for Atrazine from Title 117
C = 0.005382466 = constant used to convert cfs times μg/l to lbs/day

Because the WLA and natural background are zero (0) the entire loading capacity is the LA and can be found in Appendix B.

2.4.4 Margin of Safety

A margin of safety (MOS) must be incorporated into TMDLs in an attempt to account for uncertainty in the data analysis or targeted allocations. The MOS for this TMDL will be implicit.

For Atrazine the margin of safety will be implicit in that the load reduction calculated is based upon events with exceedances during the months of May & June. This timeframe represents the critical conditions when runoff and exceedances of Atrazine are likely to occur.

2.4.5 Load Reduction to Meet Water Quality Criteria

It is important to report the reductions necessary to meet the water quality criteria. The necessary reductions were determined based upon the data available for each stream segment, which are considered representative information. The targeted reductions provide water quality managers with a quantitative endpoint by which implementation planning can be carried out.

The required loading reductions to meet water quality criteria are determined by applying a reduction in Atrazine concentrations to the existing water quality data. For each of the flow conditions, the average reduction is increased until all collected samples within that flow condition meet water quality standards. Table 2.4.5 outlines the required reduction to meet water quality standards. These loading reductions, if achieved, would result in the listed waters meeting their assigned beneficial use for Aquatic Life.

Flow Condition	Flow Exceedance Range	Maximum Observed Atrazine Concentration (μg/L)	Loading Reduction Required (%)
BB1-10000 Atrazine Target = 12 μg/L			
High Flows	0%-10%	33.88	65
Moist Conditions	10%-40%	74.78	84
Mid-Range Flows	40%-60%	38.71	69
Dry Conditions	60%-90%	39.27	70
Low Flows	90%-100%	17.27	31
BB1-10100 Atrazine Target = 12 μg/L			
High Flows	0%-10%	34.23	65

Moist Conditions	10%-40%	2.60	--
Mid-Range Flows	40%-60%	12.39	4
Dry Conditions	60%-90%	21.12	44
Low Flows	90%-100%	No Observations	--
BB1-10800 Atrazine Target = 12 µg/L			
High Flows	0%-10%	35.31	67
Moist Conditions	10%-40%	29.59	60
Mid-Range Flows	40%-60%	34.50	66
Dry Conditions	60%-90%	25.42	53
Low Flows	90%-100%	7.95	--
BB1-10900 Atrazine Target = 12 µg/L			
High Flows	0%-10%	17.86	33
Moist Conditions	10%-40%	16.43	27
Mid-Range Flows	40%-60%	16.28	27
Dry Conditions	60%-90%	49.25	76
Low Flows	90%-100%	7.25	--
BB1-20000 Atrazine Target = 12 µg/L			
High Flows	0%-10%	56.56	79
Moist Conditions	10%-40%	47.85	75
Mid-Range Flows	40%-60%	46.20	75
Dry Conditions	60%-90%	33.66	65
Low Flows	90%-100%	6.05	--
BB2-10000 Atrazine Target = 12 µg/L			
High Flows	0%-10%	34.21	65
Moist Conditions	10%-40%	54.01	78
Mid-Range Flows	40%-60%	31.03	62
Dry Conditions	60%-90%	20.24	41
Low Flows	90%-100%	2.81	--
BB2-20000 Atrazine Target = 12 µg/L			
High Flows	0%-10%	29.48	60
Moist Conditions	10%-40%	48.50	76
Mid-Range Flows	40%-60%	19.75	40
Dry Conditions	60%-90%	39.79	70
Low Flows	90%-100%	2.45	--
BB3-10000 Atrazine Target = 12 µg/L			
High Flows	0%-10%	45.98	74
Moist Conditions	10%-40%	71.71	84
Mid-Range Flows	40%-60%	25.61	54
Dry Conditions	60%-90%	16.43	27
Low Flows	90%-100%	2.31	--
BB3-10300 Atrazine Target = 12 µg/L			
High Flows	0%-10%	11.62	--
Moist Conditions	10%-40%	45.46	74

Mid-Range Flows	40%-60%	44.15	73
Dry Conditions	60%-90%	23.04	48
Low Flows	90%-100%	1.92	--
BB3-20000 Atrazine Target = 12 µg/L			
High Flows	0%-10%	No Observation	--
Moist Conditions	10%-40%	100.50	89
Mid-Range Flows	40%-60%	41.37	71
Dry Conditions	60%-90%	1.48	--
Low Flows	90%-100%	1.26	--
BB4-10000 Atrazine Target = 12 µg/L			
High Flows	0%-10%	No Observation	--
Moist Conditions	10%-40%	29.70	60
Mid-Range Flows	40%-60%	29.00	59
Dry Conditions	60%-90%	2.21	--
Low Flows	90%-100%	No Observation	--
BB4-20800 Atrazine Target = 12 µg/L			
High Flows	0%-10%	21.22	44
Moist Conditions	10%-40%	42.87	72
Mid-Range Flows	40%-60%	14.30	17
Dry Conditions	60%-90%	29.29	60
Low Flows	90%-100%	25.85	54
BB4-40000 Atrazine Target = 12 µg/L			
High Flows	0%-10%	56.43	79
Moist Conditions	10%-40%	28.43	58
Mid-Range Flows	40%-60%	129.28	91
Dry Conditions	60%-90%	106.05	89
Low Flows	90%-100%	85.85	87

Table 2.4.5: Loading Reduction Required to Meet Water Quality Standards

2.4.6 Expression of TMDLs as Daily Loads

The April 25, 2006 decision by the U.S. District Court of Appeals for the D.C. Circuit in "Friends of the Earth, Inc. vs. EPA et. al." recommends that all TMDLs and associated wasteload allocations and load allocations include a daily expression. The approach for these TMDLs is based upon the conversion of the targeted concentration of Atrazine to pounds per day. The daily expression for each TMDL segment can be found in Appendix B.

3.0 *E. coli* TMDL

3.1 Problem Identification

Ten segments in the Big Blue River have been identified as impaired for the Primary Contact Recreation beneficial use with the parameter of concern being *E. coli* bacteria (NDEQ 2012). This section deals with the extent and nature of the water quality impairments caused by excessive *E. coli* bacteria in the Big Blue River Basin. TMDLs addressing *E. coli* for segments BB1-10000, BB1-20000 and BB3-10000 were completed and approved by EPA in 2005, updates to those TMDLs are included in this document and should be considered as Phase II TMDLs.

3.1.1 Water Quality Criteria Violated and/or Beneficial Uses Impaired

The Primary Contact Recreation beneficial use has been deemed impaired on ten segments of the Big Blue River identified below. The Primary Contact Recreation beneficial use applies to surface waters which are used or have the potential to be used for primary contact recreation that includes activities where the body may come into prolonged or intimate contact with the water such that water may be accidentally ingested or sensitive body organs (e.g. eyes, ears, nose may be exposed (NDEQ 2011).

3.1.2 Data Sources

Data *for E. coli* bacteria is collected as part of Nebraska's basin rotation monitoring network as outlined in Section 1.2

3.1.3 Water Quality Assessment

Water quality data assessments were based upon the beneficial use assessment procedures used to identify Category 5 (impaired waters) for the 2012 Integrated Report. A complete description of the water quality data assessment procedures can be found in the *Methodologies for Waterbody Assessments and Development of the 2012 Integrated Report for Nebraska* (NDEQ 2011).

The details of the assessment process to determine the use support of the Primary Contact Recreation beneficial use can be found in Table 3.1.3.

Parameter	Criteria: Season Geometric Mean	Supported	Impaired
E. coli	≤126/100 ml	Season geometric mean ≤126/100 ml	Season geometric mean >126/100 ml

Table 3.1.3: Assessment of the Primary Contact Recreation beneficial use using *E. coli* bacteria.

3.1.4 Water Quality Conditions

E. coli data collected during the 2007 Recreation season (May 1 through September 30) was assessed to determine the beneficial use support for primary contact recreation. Table 3.1.4 presents this information.

Stream Segment	Site Name	Site Location	Number of Samples	Seasonal Geometric Mean (#/100ml)
BB1-10000	SBB1BBLUE110	Big Blue River at Barneston, NE	19	268
BB1-10100	SBB1MISSN130	Mission Creek near Barneston, NE	20	211
BB1-10800	SBB1BGIND125	Big Indian at Wymore, NE	21	148
BB1-20000	SBB1BBLUE275	Big Blue River near Crete, NE	21	1414
BB2-10000	SBB2TRKEY110	Turkey Creek near Dewitt, NE	20	1033
BB2-20000	SBB2TRKEY245	Turkey Creek near Wilber, NE	19	1079
BB3-10000	SBB3WFBBR160	West Fork BBR near Dorchester, NE	20	1699
BB3-20000	SBB3WFBBR204	West Fork BBR near Cordova, NE	17	2019
BB4-10000	SBB4BBLUE165	Big Blue River at Milford, NE	19	776
BB4-20000	SBB4BBLUE218	Big Blue River at Seward, NE	19	782

Table 3.1.4: 2007 *E. coli* Data and Assessments – Category 4a and 5 waterbodies.

3.1.5 Potential Pollutant Sources

3.1.5.1 Point Sources: Point sources discharge or have the potential to discharge to waters in the Big Blue River basin. Facility types include: municipal wastewater treatment facilities (WWTF), commercial and industrial facilities. Under Section 503 of the CWA WWFTs may dispose of sewage sludge through land applications (EPA 1993). Sludge is land applied after proper stabilization and is incorporated into the soil at agronomic rates. Improper or over-application of sludge may potentially cause bacteria impairments to surface water. Nebraska is not 503 authorized State, therefore administration of section 503 of the CWA falls within the authority of EPA's Bio Solids program. The facilities that have been issued a National Pollutant Discharge Elimination System Permit (according to EPA's Enforcement & Compliance History Online) in the Big Blue River Watershed are shown in Figure 3.1.5.1a. A list of permitted facilities is located on pages 52-55 in table 3.3.3.1.

Illicit connections, discharges, combined sewer overflows, sanitary sewer overflows, straight pipes from septic tanks or failing septic systems or other failing onsite wastewater systems can also be sources of *E. coli* bacteria. Under Title 124, Chapter 3, NDEQ began requiring anyone doing work associated with onsite wastewater systems be certified by the state of Nebraska and requires systems constructed, reconstructed, altered or modified beginning January 1, 2004 to be registered (NDEQ 2012b). As of August 11, 2012 a total of 5,659 onsite wastewater systems have been registered within the Big Blue River basin. Systems installed prior to 2004 were not required to be registered; therefore the exact number of septic systems or failing septic systems is not possible to determine. According to the National Environmental Services Center it is estimated that 40% of all septic systems are presently failing and about 6% of systems are either repaired or replaced annually (NESC 2013).

Active animal feeding operations (AFO) are also considered potential sources. Figure 3.1.5.1b shows the AFOs within the Big Blue River watershed that have been entered into the NDEQ database as being inspected. As of April 2013 there were 1567 LWC facilities within the Big Blue River watershed, see Appendix D for the complete list. An operation that has discharged, or has the potential to discharge, livestock waste to waters of the State is required to obtain a permit issued by the State of Nebraska for construction and operation of livestock waste control facilities

(LWCF). These facilities are designed to contain any run-off that is generated by storm events that are less in intensity than the 25-year, 24-hour rainfall.

3.1.5.2 Nonpoint Sources: Several nonpoint sources of *E. coli* exist in the Big Blue River watershed. These sources include: unregistered onsite wastewater septic systems, improper or over-application of biosolids and urban stormwater runoff not regulated by an NPDES permit.

3.1.5.3 Natural Sources: The primary natural source of *E. coli* is wildlife. A variety of wildlife is native to or have adapted to the diverse habitat of the Big Blue River watershed. Big game, upland game, furbearers, waterfowl and non-game species have been documented to reside within the basin.

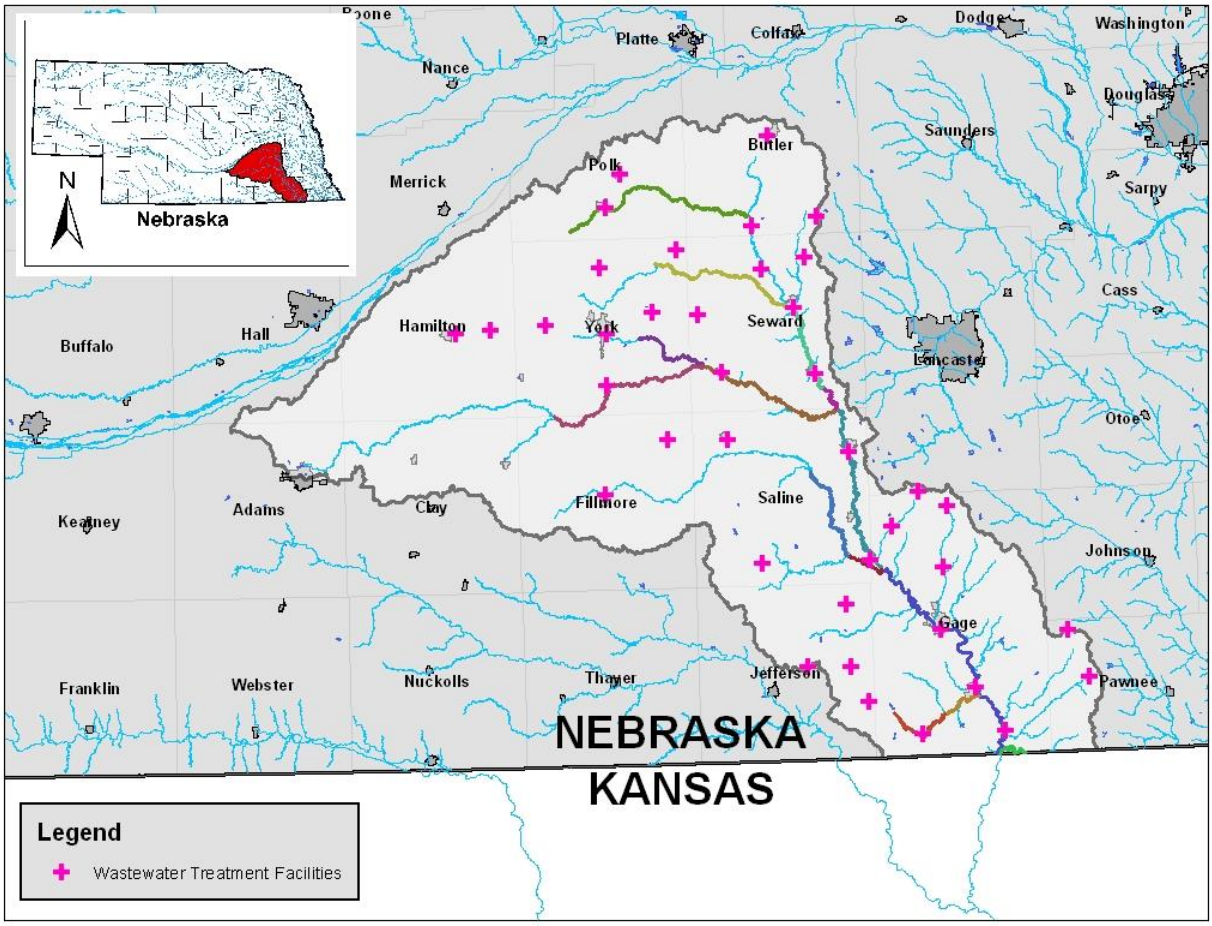

Figure 3.1.5.1a: NPDES Permitted Facilities in Big Blue River Watershed with *E.coli* Limits

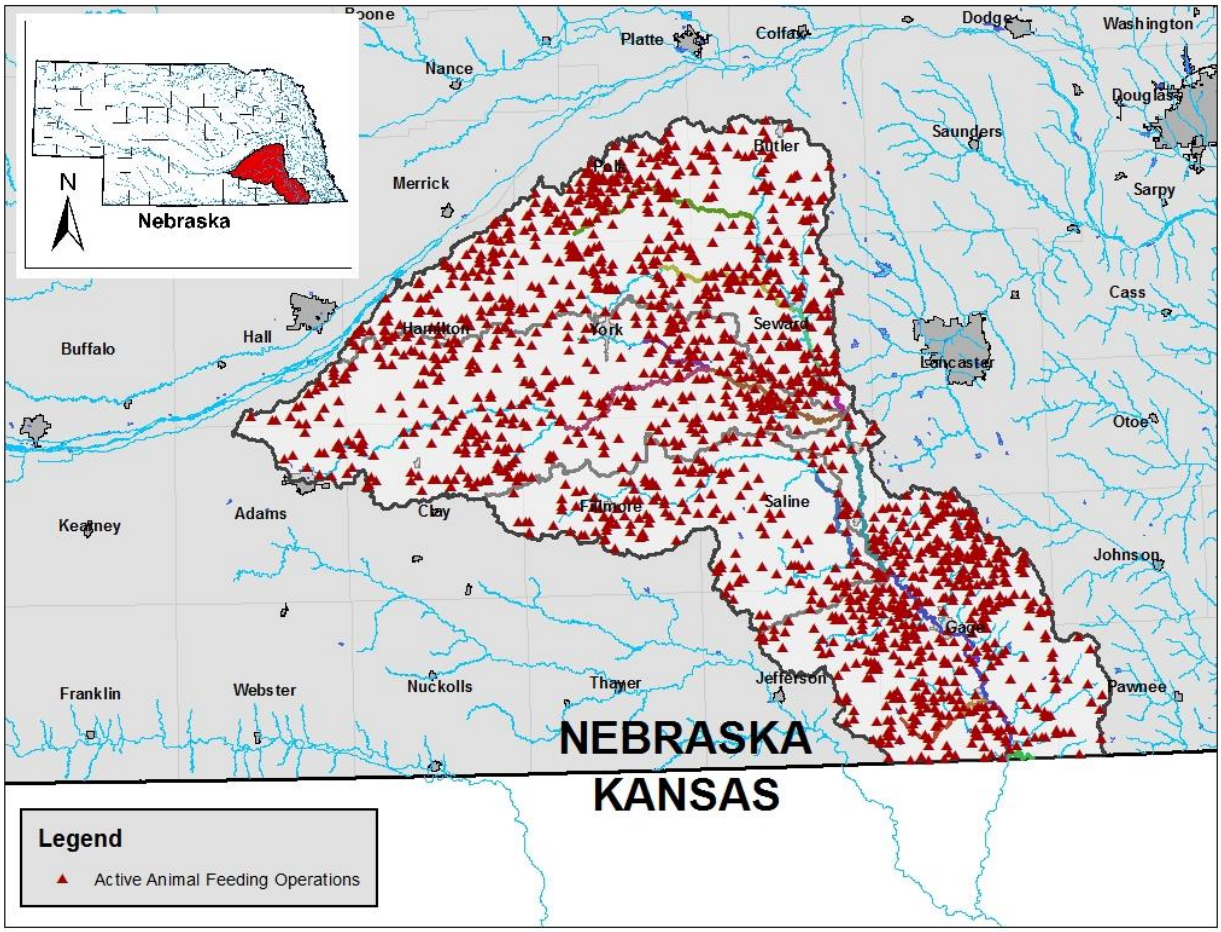

Figure 3.1.5.1b: Active Animal Feeding Operations in the Big Blue River Watershed

3.2 TMDL Endpoint

The endpoint for these TMDLs will be based on the numeric criteria associated with the Primary Contact Recreation beneficial use.

3.2.1 Numeric Water Quality Criteria

Water quality criteria established for the protection of the Primary Contact Recreation beneficial use can be found in Title 117, Chapter 4, and are applicable between May 1 and September 30th (NDEQ 2012):

> *002.01 E. coli.*
> *E. coli* bacteria shall not exceed a geometric mean of 126/100 ml. For increased confidence of the criteria, the geometric mean should be based on a minimum of five samples taken within a 30-day period. This does not preclude fecal coliform limitations based on effluent guidelines. The following single sample maxima shall be used solely for issuing periodic public advisories regarding use of waterbodies for Primary Contact Recreation.

002.01A 235/100 ml at designated bathing beaches

002.01B 298/100 ml at moderately used recreational waters

002.01C 406/100 ml at lightly used recreational waters

002.01D 576/100 ml at infrequently used recreational waters

The November 16, 2004 Federal Register (Volume 69, No. 220) contained information regarding the final rule for "Water Quality Standards for Costal and Great Lakes Recreational Waters". This rule includes a discussion on the use of the single season maximum (SSM). Specifically:

> *"EPA expects that the single season maximum values would be used for making beach notification and closure decisions. EPA recognizes however that States and Territories also use criteria in their water quality standards for other purposes under the Clean Water Act in order to protect and improve water quality. Other than in the beach notification and closure decision context, the geometric mean is the more relevant value for ensuring that appropriate actions are taken to protect and improve water quality because it is a more reliable measure, being less subject to random variation and more directly linked to the underlying studies on which the 1986 criteria were based."*

Given this discussion and recommendation regarding the use of single season maximum in TMDLs and waterbody assessments, these TMDLs will focus on meeting the *E. coli* recreation season geometric mean of 126/100 ml.

3.2.2 Selection of Critical Environmental Conditions

The water quality criteria associated with the Primary Contact Recreation beneficial use only applies from May 1 through September 30. Therefore, the critical conditions for these TMDLs will be those occurring from May 1 through September 30.

3.2.3 Waterbody Pollutant Loading Capacity

Defining waterbody pollutant loading capacity implies a steady state. These TMDLs recognize that loadings are dynamic and can vary with stream flow. Additionally, section 3.1.5 above indicates a wide range of environmental conditions that must be accounted for.

The method chosen to account for the variation in flow is based upon a data assessment (TMDL) curve. Data assessment curves are initiated by the development a stream's hydrograph using the long-term gage information. The flow information (curve) is then translated into a load curve by multiplying the flow values by the water quality standard (WQS) and a conversion factor (C). The acceptable "load" is then plotted graphically. Therefore, the loading capacity for each of the segments will be defined by:

$$\text{Loading capacity} = \text{WQS} \times \text{Flow} \times \text{C}$$

The waterbody pollutant loading capacities can be found in Appendix C.

3.3 Pollutant Source Assessment

For these TMDLs the source loading is based upon the position of the monitoring data points in relation to the boundary established on the data assessment curve between point source and nonpoint source

influences. This process for selecting the load point is described in the document entitled *Nebraska's Approach for Developing TMDLs for Streams Using the Load Duration Curve Methodology* (NDEQ 2002). In the situation where a boundary has not been included on a data assessment curve, the information indicates no point source facilities discharge to the contributing watershed. For these waterbodies, the pollutant will be considered derived from nonpoint and natural sources.

3.3.1 Existing Pollutant Conditions

The existing pollutant conditions are shown in the data assessment curves (Figures 3.3.1a through 3.3.1j) provided for each of the segments where a TMDL is being developed. The points plotted above the acceptable loading indicate a deviance from the water quality criteria. The purpose for inclusion of the data assessment curves for these waterbodies is to present a comparison of the water quality data to the stream flow and attempt to explain the conditions under which the data was collected.

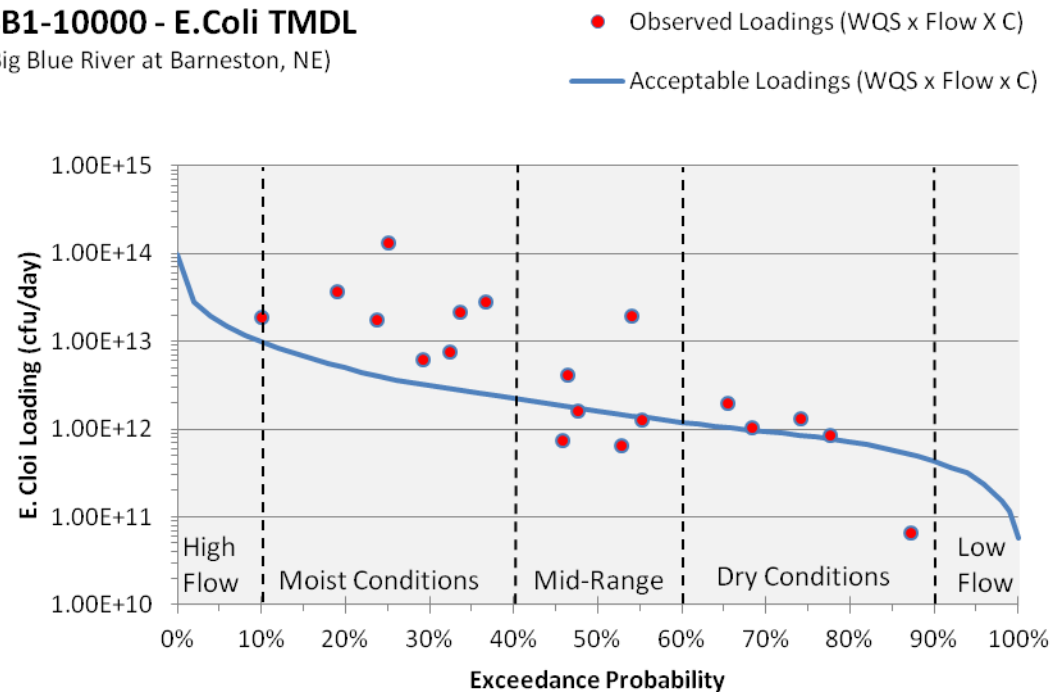

Figure 3.3.1a: Data Assessment Curve for Big Blue River segment B**B1-10000**

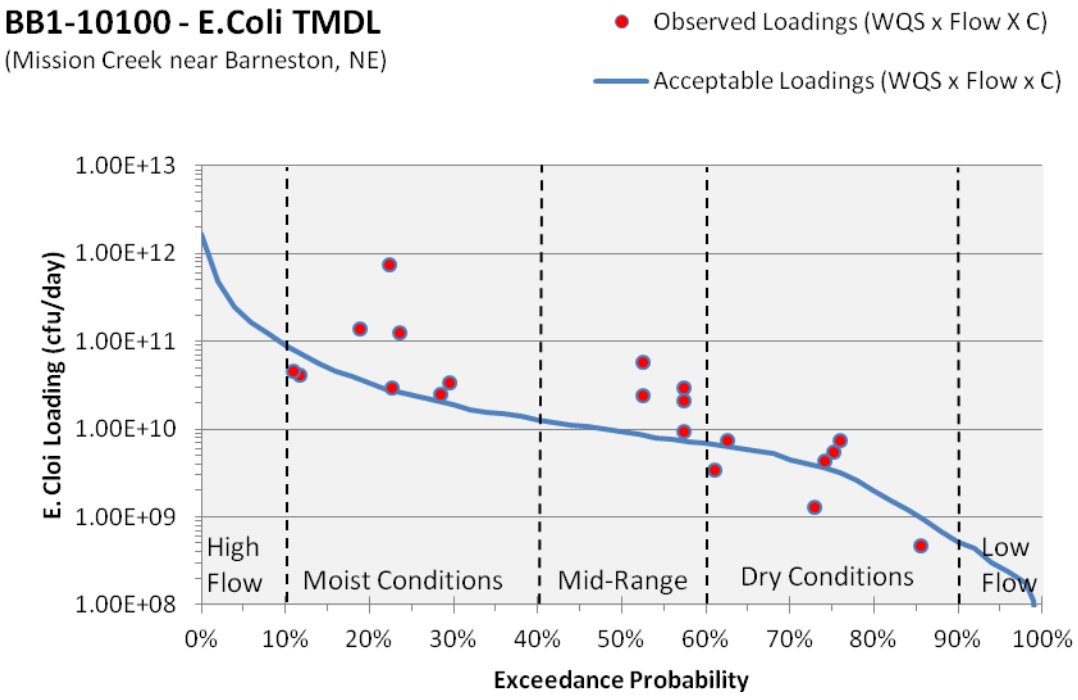

Figure 3.3.1b: Data Assessment Curve for Mission Creek segment BB1-10100

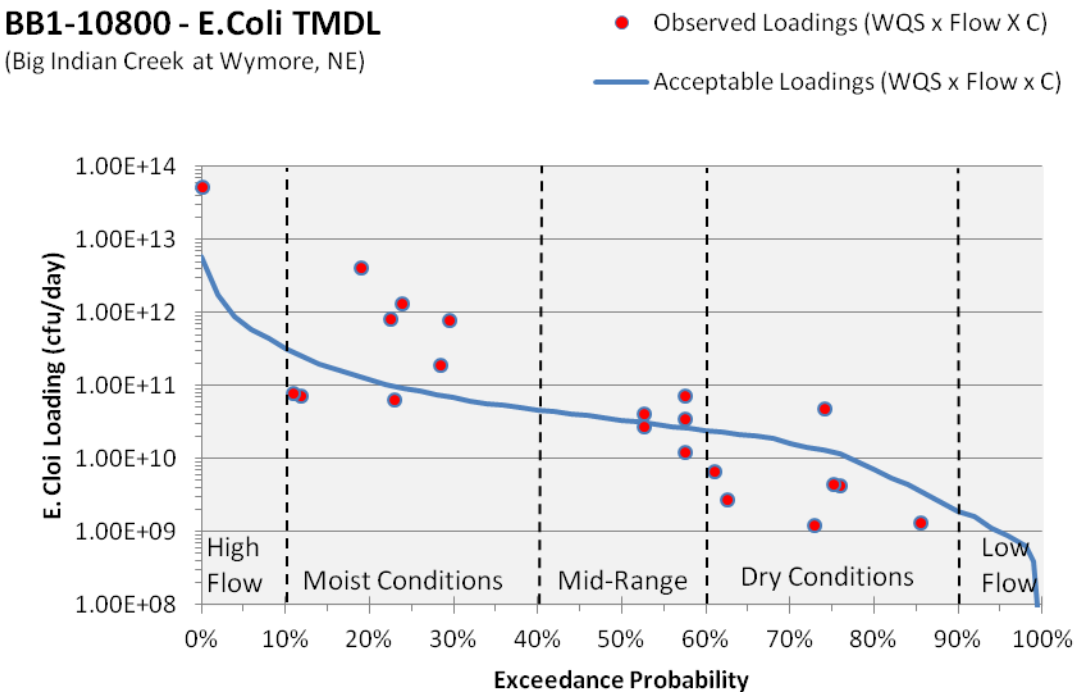

Figure 3.3.1c: Data Assessment Curve for Big Indian Creek segment BB1-10800

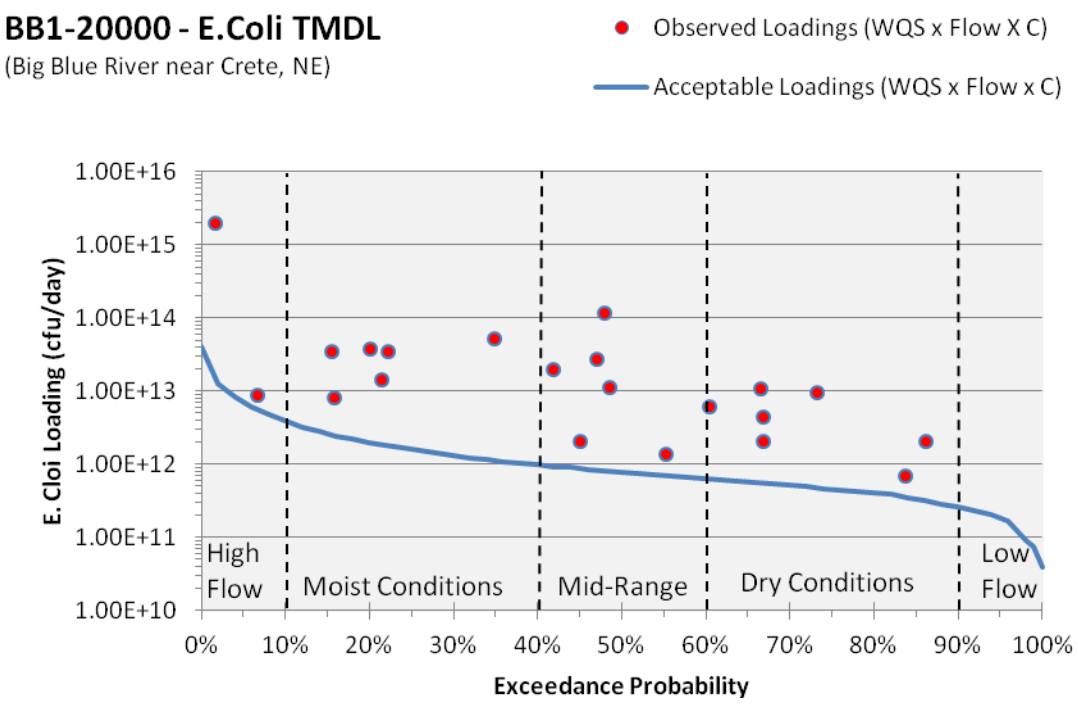

Figure 3.3.1d: Data Assessment Curve for Big Blue River segment BB1-20000

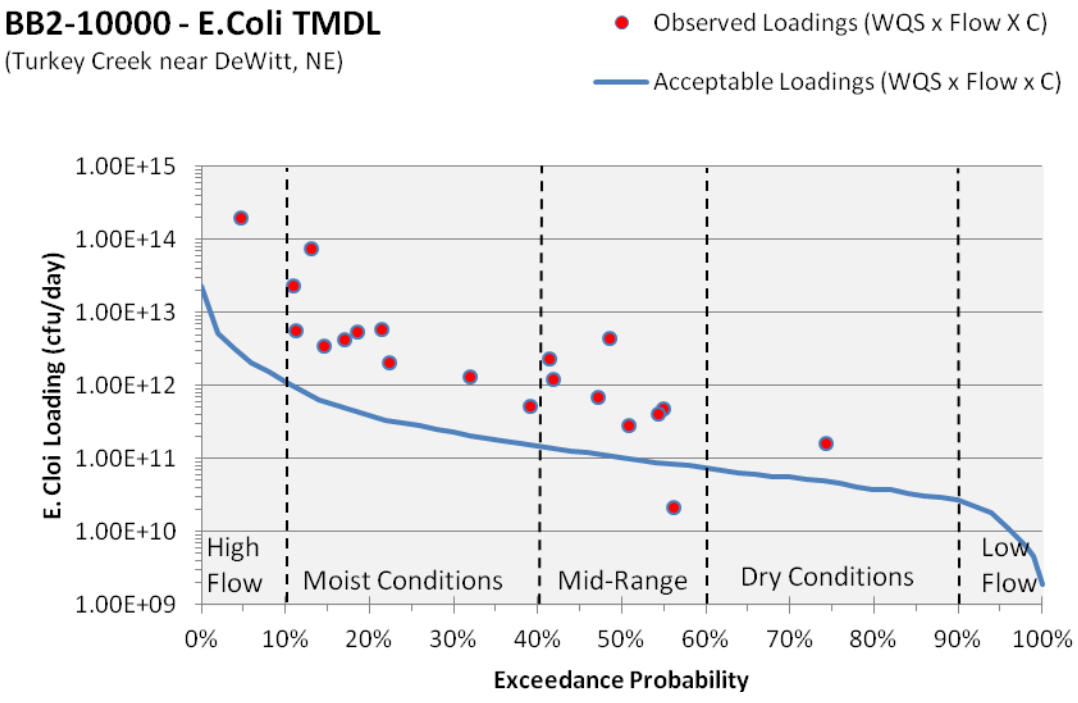

Figure 3.3.1e: Data Assessment Curve for Turkey Creek segment BB2-10000

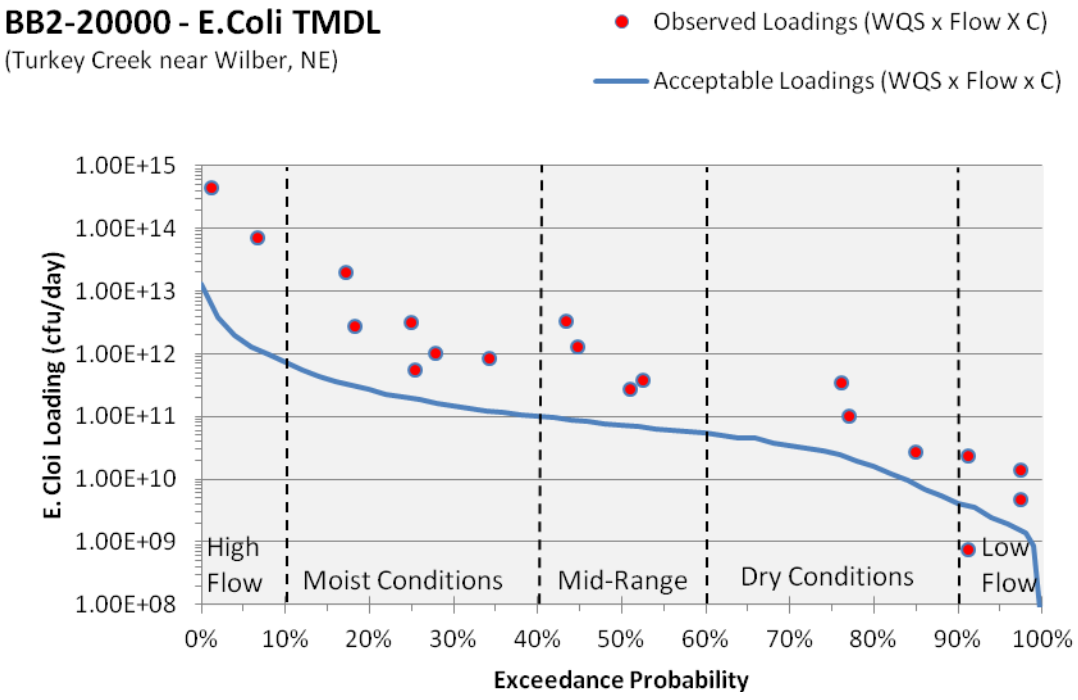

Figure 3.3.1f: Data Assessment Curve for Turkey Creek segment BB2-20000

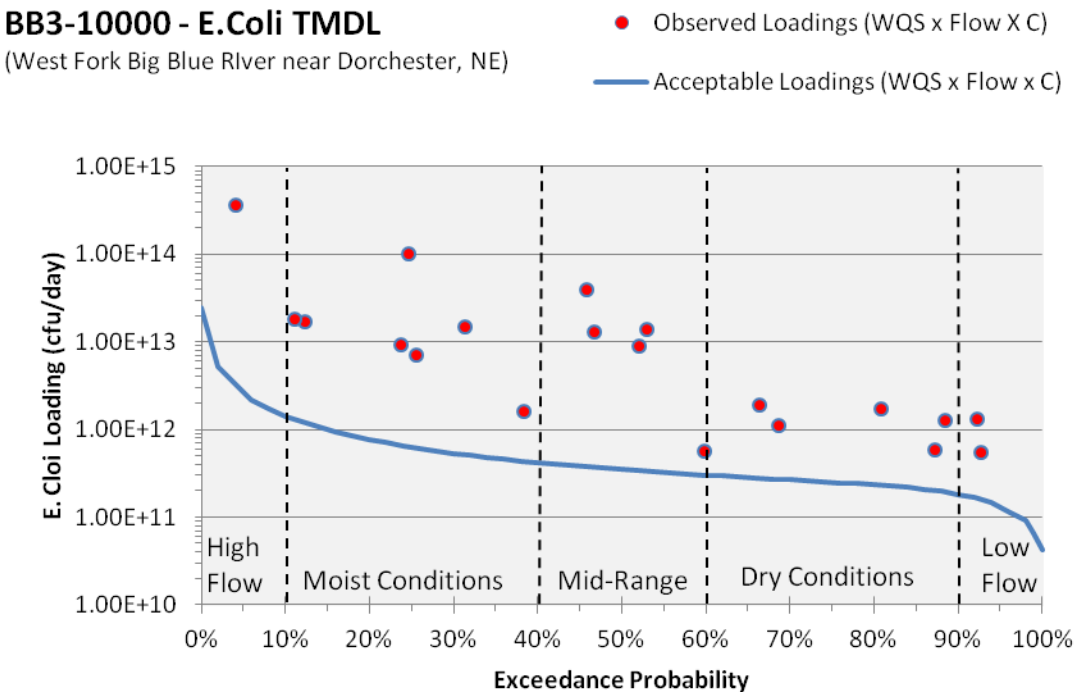

Figure 3.3.1g: Data Assessment Curve for West Fork BBR segment BB3-10000

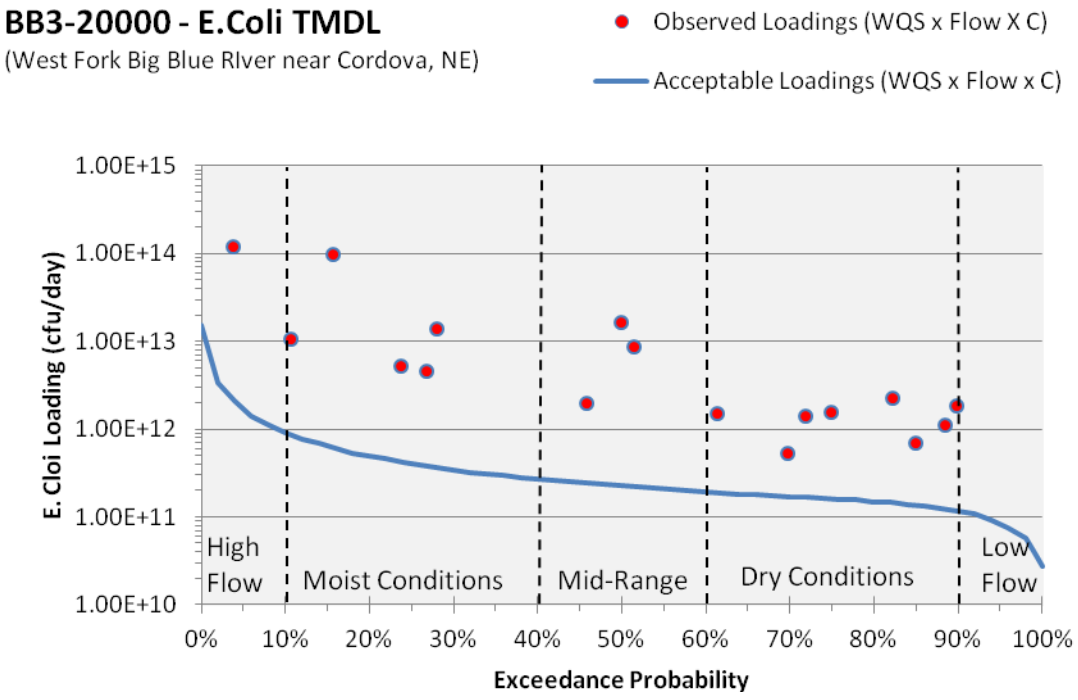

Figure 3.3.1h: Data Assessment Curve for West Fork BBR segment BB3-20000

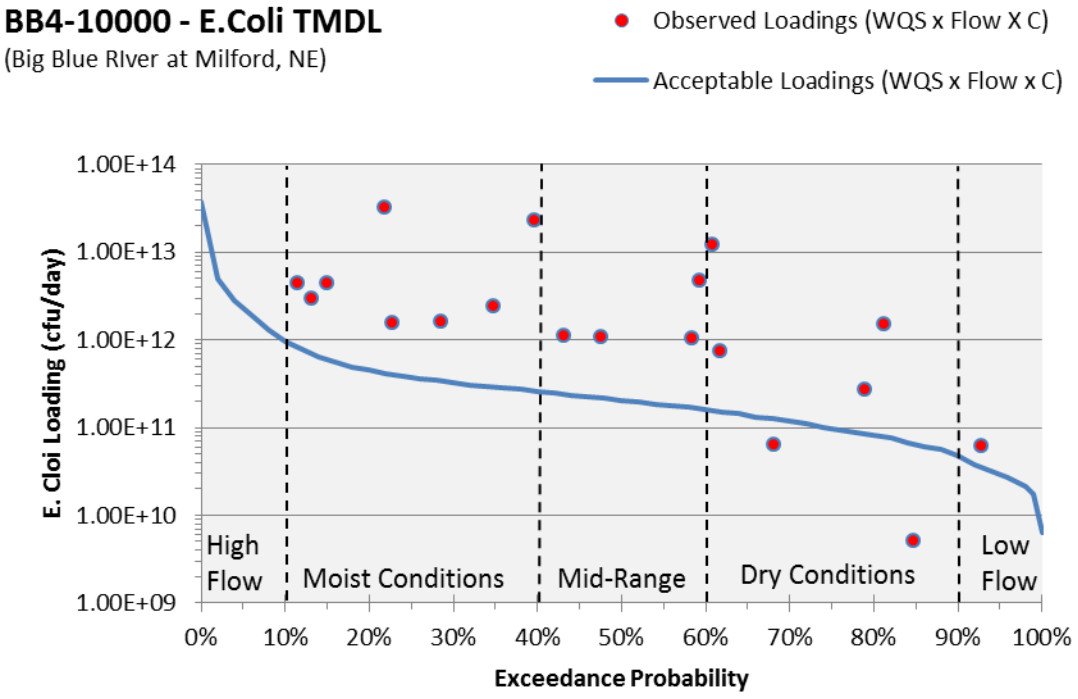

Figure 3.3.1i: Data Assessment Curve for Big Blue River segment BB4-10000

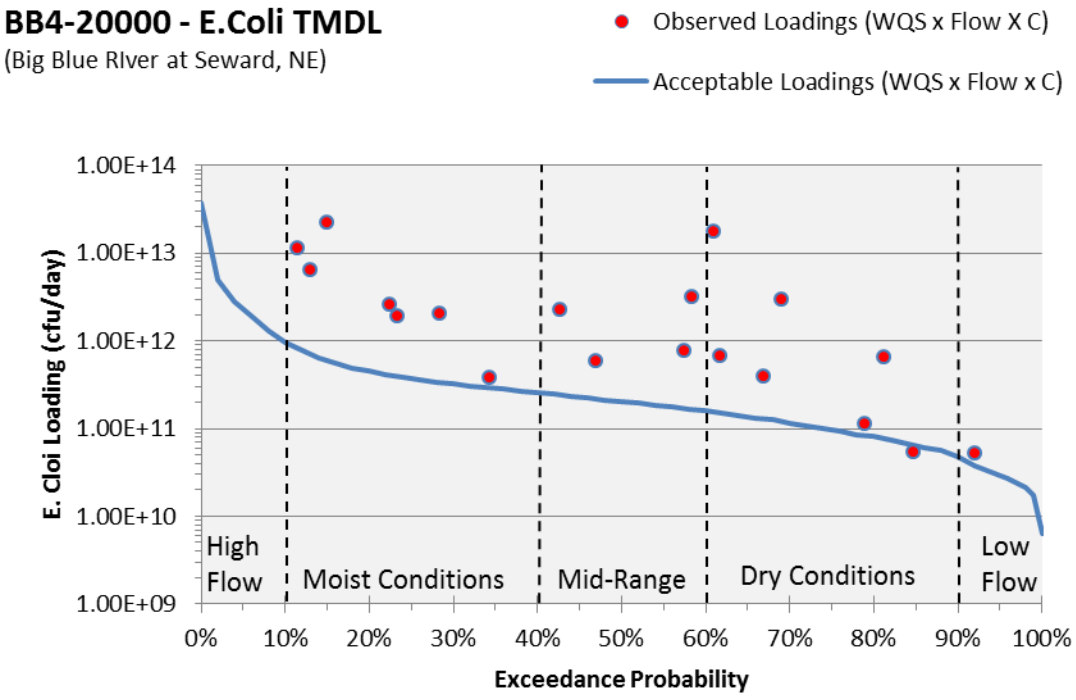

Figure 3.3.1j: Data Assessment Curve for Big Blue River segment BB4-20000

As previously mentioned, E. coli TMDLs for segments BB1-10000 BB1-20000 and BB3-10000 were approved by EPA in 2005, and thus the TMDLs provided in this document should be considered as Phase II TMDLs.

3.3.2 Deviation from Acceptable Pollutant Loading Capacity

Table 3.3.2.1 describes the deviation from the acceptable water quality standards based upon the 2007 *E. coli* monitoring information.

Impaired Segment	Waterbody Name	2007 Seasonal Geometric Mean (#/100ml)	E. coli Above WQS (#100ml)
BB1-10000	Big Blue River	268	142
BB1-10100	Mission Creek	211	85
BB1-10800	Big Indian Creek	148	22
BB1-20000	Big Blue River	1414	1288
BB2-10000	Turkey Creek	1033	907
BB2-20000	Turkey Creek	1079	953
BB3-10000	West Fork Big Blue River	1699	1573
BB3-20000	West Fork Big Blue River	2019	1893
BB4-10000	Big Blue River	776	650
BB4-20000	Big Blue River	782	656

Table 3.3.2.1: Deviation from the Applicable Water Quality Criteria

Table 3.3.2.2 outlines a comparison of the water quality conditions during Phase I and Phase II of TMDL development to determine what improvements, if any have occurred. Figures 3.3.2.2.a – 3.3.2.2.c show 2007 was a wetter year than 2002, therefore the nonpoint sources of *E.coli* are comparatively higher during the 2007 sampling season. Table Results as well as Hydrographs from each site comparing 2002 to 2007 show that the water quality conditions have remained relatively unchanged since Phase I of TMDL development.

Impaired Segment	Waterbody Name	2002 Water Quality Conditions *E. coli* (cfu/100ml)	2007 Water Quality Conditions *E. coli* (cfu/100ml)	% Improvement
BB1-10000	Big Blue River	187	268	-43%
BB1-20000	Big Blue River	1083	1414	-31%
BB3-10000	West Fork Big Blue River	1540	1699	-10%

Table 3.3.2.2: Phase I and Phase II *E. coli* Concentrations

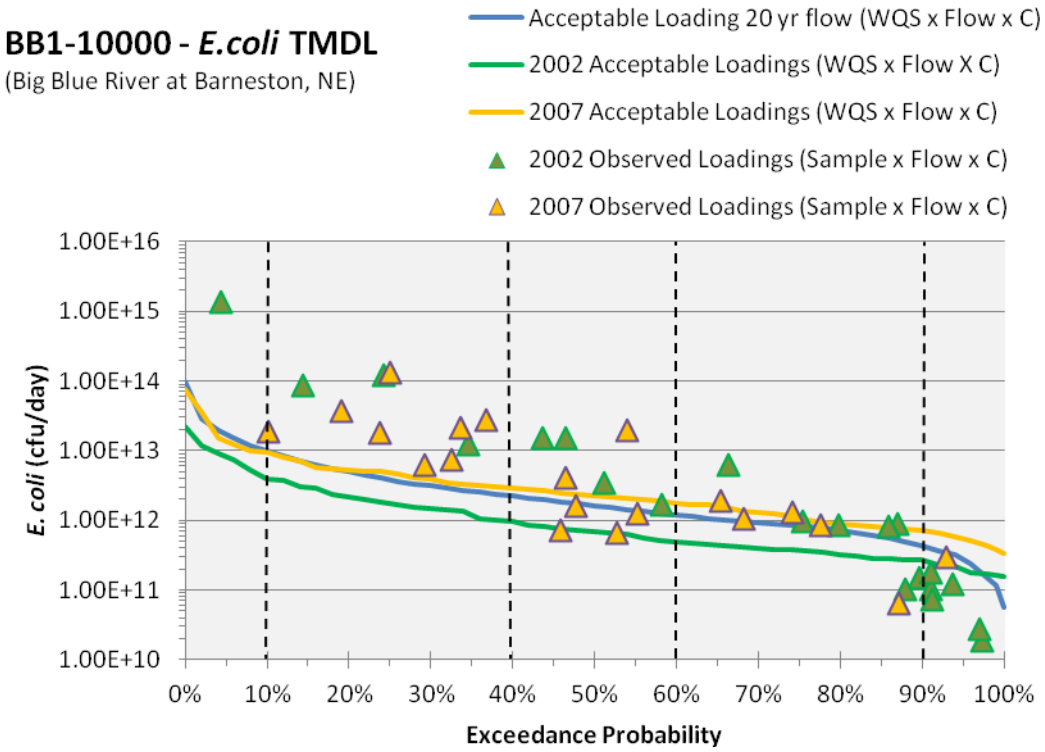

Figure 3.3.2.a: Phase I and Phase II Data Assessment Curve BB1-10000

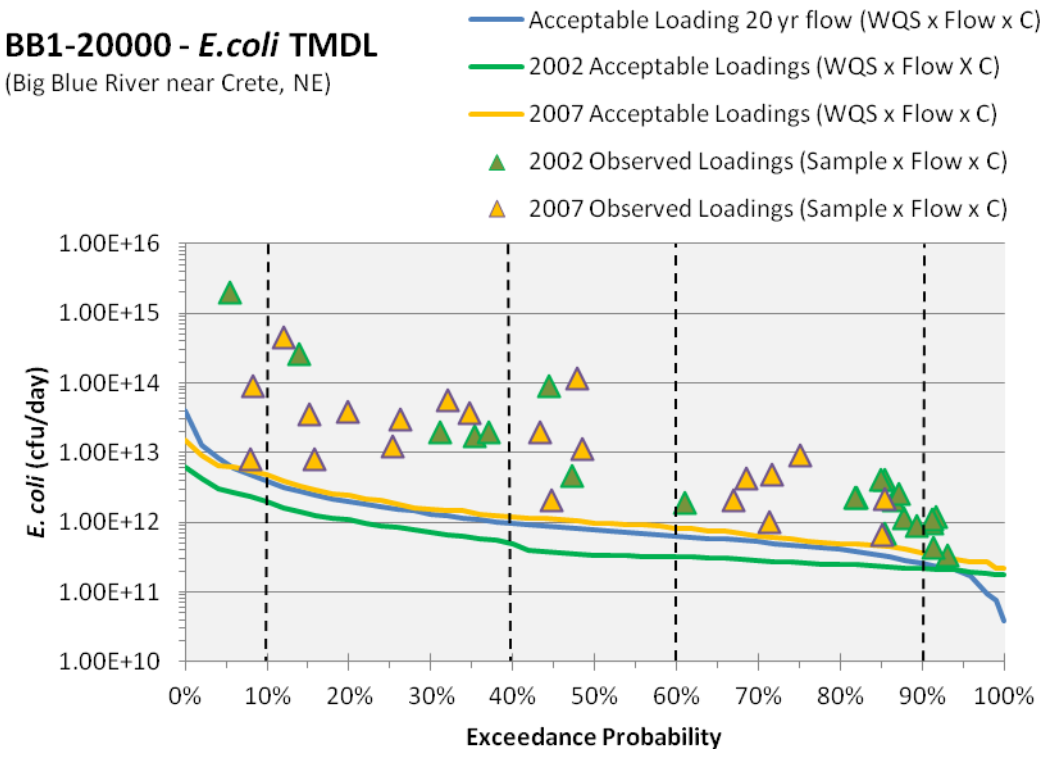

Figure 3.3.2.b: Phase I and Phase II Data Assessment Curve BB1-20000

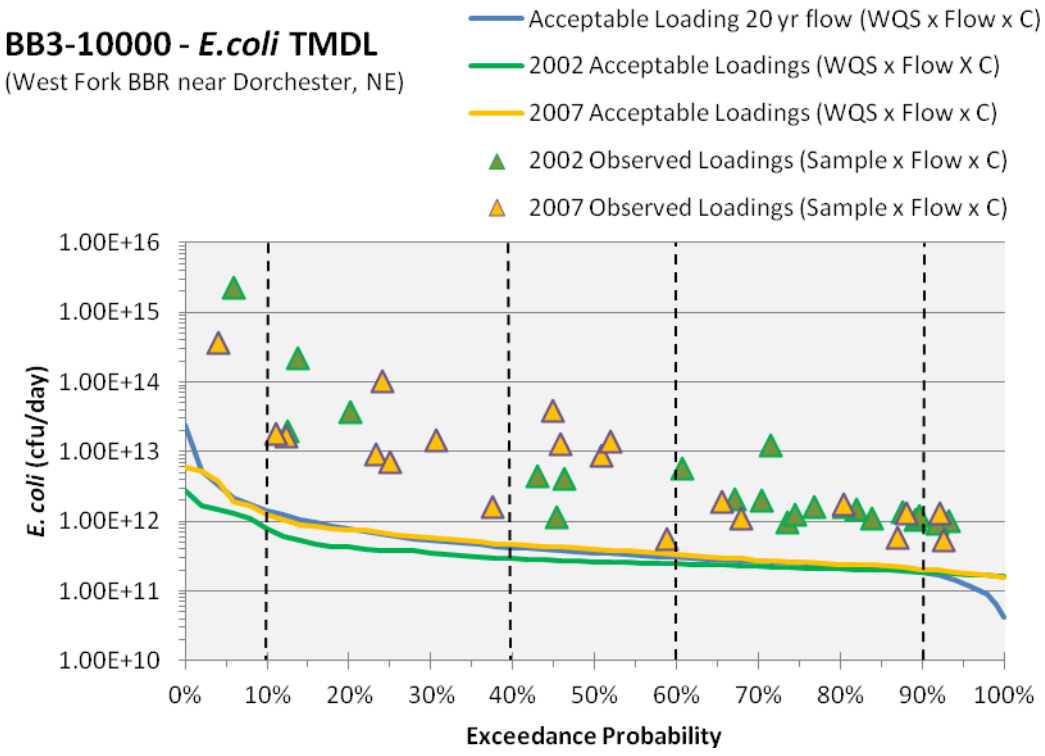

Figure 3.3.2.c: Phase I and Phase II E Data Assessment Curve BB3-10000

3.3.3 Identification of Pollutant Sources

Point sources are contributing to the *E. coli* impairment within in all segments except BB1-10100. Facilities that discharge either directly to or into a tributary of the Big Blue River recreation segments that are a potential source are listed in Table 3.3.3.1 below. Note that in 2002 version of the Phase II TMDLs, the WWTF at Filley, Koch Nitrogen Company and the Homestead Nitrogen Operations for segment BB1-10000 were included. The WWTF at Wilber, Dorchester, Friend, and Rising City as well as Farmland Foods Inc., Nestle Purina Petcare Company and the NDOR Blue River Facility for segment BB1-20000 were included. The WWTF at Hastings, Fairmont and Grafton as well as Equalizer Midwest Inc. and Chief Ethanol Fuels Inc. for segment BB3-10000 were included. Since then, the permits for these facilities have not been renewed.

Impaired Reach	Facility Name	NPDES Permit #	Receiving Stream	Design Flow (cfs)
BB1-10000	AURORA WWTF	NE0031810	BB4-20900	0.464
	BARNESTON WWTF	NE0121711	BB1-10000	0.028
	BEATRICE WWTF	NE0020915	BB1-10000	2.558
	BEAVER CROSSING WWTF	NE0023981	BB3-10000	0.668
	BEE WWTF	NE0123200	BB4-20700	0.048
	BENEDICT WWTF	NE0114944	BB4-20900	0.051
	BRADSHAW WWTF	NE0121321	BB3-10400	0.056
	BURCHARD WWTF	NE0113638	BB1-10500	0.025
	CLATONIA WWTF	NE0045101	BB1-20100	0.048
	CORTLAND WWTF	NE0027782	BB1-11700	0.048
	CRETE WWTF	NE0034304	BB1-20000	0.045
	DAVID CITY WWTF	NE0021199	BB4-30200	0.572
	DEWITT WWTF	NE0024341	BB1-20000	0.186
	DILLER WWTF	NE0129500	BB1-10900	0.039
	DWIGHT WWTF	NE0046175	BB4-20700	0.032
	EXETER WWTF	NE0040941	BB3-10100	0.153
	FRIEND WWTF	NE0024007	BB2-30000	0.186
	GENEVA WWTF	NE0031763	BB2-40000	0.996
	GRESHAM WWTF	NE0027359	BB4-20800	0.063
	HALLAM WWTF	NE0028282	BB1-20100	0.005
	HAMPTON WWTF	NE0114979	BB3-10400	0.062
	HARBINE WWTF	NE0114171	BB1-10900	0.006
	JANSEN WWTF	NE0045233	BB1-11900	0.026
	LEWISTON WWTF	NE0026051	BB1-10610	0.019
	MCCOOL JUNCTION WWTF	NE0121932	BB3-20000	0.080
	MILFORD WWTF	NE0024333	BB4-20000	3.481
	ODELL WWTF	NE0040975	BB1-10900	0.077
	OSCEOLA WWTF	NE0046230	BB4-40000	0.155
	PICKRELL WWTF	NE0045276	BB1-11700	0.062

	PLYMOUTH WWTF	NE0040894	BB1-10000	0.070
	SEWARD WWTF	NE0023876	BB4-20600	1.563
	STAPLEHURST WWTF	NE0040959	BB4-30000	0.062
	STROMSBURG WWTF	NE0024325	BB4-40000	0.217
	ULYSSES WWTF	NE0024368	BB4-30000	0.050
	UTICA WWTF	NE0045365	BB3-10300	0.155
	WACO WWTF	NE0045004	BB3-10300	0.139
	WESTERN WWTF	NE0042501	BB2-10200	0.068
	WYMORE WWTF	NE0021130	BB1-10000	0.619
	YORK WWTF	NE0040932	BB3-10400	3.574
			Total	16.755
BB1-20000	BEAVER CROSSING WWTF	NE0023981	BB3-10000	0.668
	BENEDICT WWTF	NE0114944	BB4-20900	0.051
	EXETER WWTF	NE0040941	BB3-10100	0.153
	MCCOOL JUNCTION WWTF	NE0121932	BB3-20000	0.080
	UTICA WWTF	NE0045365	BB3-10300	0.155
	WACO WWTF	NE0045004	BB3-10300	0.139
	YORK WWTF	NE0040932	BB3-10400	3.574
	BRADSHAW WWTF	NE0121321	BB3-10400	0.056
	HAMPTON WWTF	NE0114979	BB3-10400	0.062
	MILFORD WWTF	NE0024333	BB4-20000	3.481
	SEWARD WWTF	NE0023876	BB4-20600	1.563
	BEE WWTF	NE0123200	BB4-20700	0.048
	DWIGHT WWTF	NE0046175	BB4-20700	0.032
	STAPLEHURST WWTF	NE0040959	BB4-30000	0.062
	ULYSSES WWTF	NE0024368	BB4-30000	0.050
	GRESHAM WWTF	NE0027359	BB4-20800	0.063
	STROMSBURG WWTF	NE0024325	BB4-40000	0.217
	OSCEOLA WWTF	NE0046230	BB4-40000	0.155
	DAVID CITY WWTF	NE0021199	BB4-30200	0.572
	AURORA WWTF	NE0031810	BB4-20900	0.464
	CRETE WWTF	NE0034304	BB1-20000	0.045
	DEWITT WWTF	NE0024341	BB1-20000	0.186
	CLATONIA WWTF	NE0045101	BB1-20100	0.048
	HALLAM WWTF	NE0028282	BB1-20100	0.005
			Total	11.929
BB1-10800	ODELL WWTF	NE0040975	BB1-10900	0.077
	HARBINE WWTF	NE0114171	BB1-10900	0.006
	DILLER WWTF	NE0129500	BB1-10900	0.039
			Total	0.122
BB2-10000	GENEVA WWTF	NE0031763	BB2-40000	0.996

	FRIEND WWTF	NE0024007	BB2-30000	0.186
	WESTERN WWTF	NE0042501	BB2-10200	0.068
			Total	1.250
BB2-20000	GENEVA WWTF	NE0031763	BB2-40000	0.996
	FRIEND WWTF	NE0024007	BB2-30000	0.186
			Total	1.182
BB3-10000	BEAVER CROSSING WWTF	NE0023981	BB3-10000	0.668
	EXETER WWTF	NE0040941	BB3-10100	0.153
	MCCOOL JUNCTION WWTF	NE0121932	BB3-20000	0.080
	UTICA WWTF	NE0045365	BB3-10300	0.155
	WACO WWTF	NE0045004	BB3-10300	0.139
	YORK WWTF	NE0040932	BB3-10400	3.574
	BRADSHAW WWTF	NE0121321	BB3-10400	0.056
	HAMPTON WWTF	NE0114979	BB3-10400	0.062
			Total	4.888
BB3-20000	MCCOOL JUNCTION WWTF	NE0121932	BB3-20000	0.080
			Total	0.080
BB4-10000	MILFORD WWTF	NE0024333	BB4-20000	3.481
	BENEDICT WWTF	NE0114944	BB4-20900	0.051
	SEWARD WWTF	NE0023876	BB4-20600	1.563
	BEE WWTF	NE0123200	BB4-20700	0.048
	DWIGHT WWTF	NE0046175	BB4-20700	0.032
	STAPLEHURST WWTF	NE0040959	BB4-30000	0.062
	ULYSSES WWTF	NE0024368	BB4-30000	0.050
	GRESHAM WWTF	NE0027359	BB4-20800	0.063
	STROMSBURG WWTF	NE0024325	BB4-40000	0.217
	OSCEOLA WWTF	NE0046230	BB4-40000	0.155
	DAVID CITY WWTF	NE0021199	BB4-30200	0.572
	AURORA WWTF	NE0031810	BB4-20900	0.464
			Total	6.758
BB4-20000	MILFORD WWTF	NE0024333	BB4-20000	3.481
	BENEDICT WWTF	NE0114944	BB4-20900	0.051
	SEWARD WWTF	NE0023876	BB4-20600	1.563
	BEE WWTF	NE0123200	BB4-20700	0.048
	DWIGHT WWTF	NE0046175	BB4-20700	0.032
	STAPLEHURST WWTF	NE0040959	BB4-30000	0.062
	ULYSSES WWTF	NE0024368	BB4-30000	0.050
	GRESHAM WWTF	NE0027359	BB4-20800	0.063
	STROMSBURG WWTF	NE0024325	BB4-40000	0.217
	OSCEOLA WWTF	NE0046230	BB4-40000	0.155
	DAVID CITY WWTF	NE0021199	BB4-30200	0.572

	AURORA WWTF	NE0031810	BB4-20900	0.464
			Total	6.758

Table 3.3.3.1: NPDES Permitted Facilities with *E. coli* limits in the Big Blue River Basin

3.4 Pollutant Allocation

A TMDL is defined as:

TMDL = Loading Capacity = WLA + LA + Background + MOS

As stated above, the loading capacity is based upon flow position in the hydrograph and is defined by:

Load Capacity = Flow x 126/100 ml x C

Where:

Flow = Stream flow volume (cubic feet per second)
126/100 ml = applicable/target water quality criteria for *E. coli* from Title 117
C = conversion factor.

By federal regulation, a TMDL requires a loading capacity value for the pollutant of concern. In the case of *E. coli*, a "load" (flow rate x concentration x conversion factor) could be calculated, but the approach may not be appropriate for expressing this non-conservative parameter. Therefore, for the purposes of these TMDLs, a loading capacity will not be "calculated" but will be expressed as the water quality standard. The flow hydrographs (0-100th Percentile) used in the *E. coli* TMDLs are provided in Table 3.4 and daily load information is located in Appendix C.

Percent Exceedance	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%	0%
Reach											
BB1-10000 (cfs)	18	140	229	304	384	519	718	1012	1648	3244	31620
BB1-10100 (cfs)	0	0.17	0.65	1.4	2.2	3	4	6	11	29	538
BB1-10800 (cfs)	0	1	2	5	8	11	15	22	39	106	1946
BB1-20000 (cfs)	12	84	132	171	207	250	318	429	640	1290	13104
BB2-10000 (cfs)	1	9	13	18	25	35	50	75	132	354	7390
BB2-20000 (cfs)	0	1	5	11	18	24	33	48	87	232	4264
BB3-10000 (cfs)	14	59	76	86	98	115	137	172	248	455	7874
BB3-20000 (cfs)	9	38	48	55	62	73	87	110	158	290	5025
BB4-10000 (cfs)	2	15	27	38	52	66	84	105	147	308	12380
BB4-20000 (cfs)	2	15	27	38	52	65	83	104	146	306	12278

Table 3.4.a: Recreation Season Hydrograph for the Big Blue River Basin *E. coli* TMDLs

To achieve the desired loading capacities requires the following allocations:

3.4.1 Wasteload Allocations

3.4.1.1 NPDES Permitted Facilities: Title 117 does not allow for the application of a mixing zone for the initial assimilation of effluents in order to meet the criteria associated with the recreation beneficial use. Because of this, the water quality criteria are applied to the “end-of-

pipe" concentrations and are applicable at all stream flows >7q10 (lowest stream flow for seven consecutive days that would be expected to occur once in ten years). Therefore, the *E. coli* wasteload allocation established by this TMDL will be the monthly geometric mean 126/100 ml.

The wasteload allocation will initially be applied to all facilities that discharge directly to a recreational segment. Meeting the WLA will be achieved by adhering to the existing compliance schedules for bacteria, included within the NPDES permits.

Typically, to achieve NPDES compliance for bacteria, discharging facilities need to provide for some form of disinfection. Disinfection systems are often designed and operated to achieve 100% reduction in the indicator bacteria or 0/100ml. Thus, the actual NPDES permitted point source contributions, upon meeting compliance schedules, is likely to be less than the WLA assigned above (126/100ml). Future monitoring and evaluation will be utilized to determine if *E. coli* limitations are necessary for facilities discharging to the recreation segment's tributaries.

3.4.1.2 Dry Weather Discharges: Dry weather discharges can both be from illicit sources, cross-connections or mechanical failure and often exhibit the greatest influence on the base flow conditions of the stream. Thus, it is most appropriate to group these discharges and limit similarly to the WWTFs. Specifically, the wasteload allocations assigned to these discharges shall be a seasonal geometric mean of 0 cfu/100 ml.

3.4.1.3 Non-Discharging Facilities: Several facilities including concentrated animal feeding operations (CAFOs) and lagoons are designed for "zero" discharge. In the case of animal feeding operations, discharges may only occur as the result of a 25 year 24 hour storm event or a chronic wet period with an accumulative precipitation equivalent to a 25 year 24 hour storm. Based on this permitting provision, the WLA for facilities classified as non-discharging will be zero (0).

3.4.2 Load Allocations

The load allocations assigned to these TMDLs will be based upon the stream flow volume and will be defined as:

$$LA_i = LC - WLA - MOS = (Q_i \times 126/100 \text{ ml} \times C) - WLA - MOS$$

Where:
LA_i = load allocations at the i^{th} flow
Q_i = stream flow at the i^{th} flow
126/100 ml = applicable/target water quality criteria for *E. coli* from Title 117
C = conversion factor

3.4.3 Margin of Safety

A margin of safety (MOS) must be incorporated into TMDLs in an attempt to account for uncertainty in the data, analysis or targeted allocations. The MOS can either be explicit or implicit and for these TMDLs are as follows:

- To account for uncertainty in the nonpoint source load reduction, the targeted reductions will be set at 90% of the water quality target (126/100 ml). Specifically the reductions shall be applied to meet a seasonal geometric mean of ≤113/100 ml.

- Decay and/or die off of *E. coli* were not accounted for in either the source assessment or in establishment of the load reduction. That is, the entire concentration/load from the source was assumed to be present within the waterbody and the reductions should focus on the load.

- These TMDLs assumed the effluents discharge the *E. coli* density allowed by the WLA or 126/100 ml. WWTF disinfection systems are often designed and operated to achieve 100% reduction in the indicator bacteria or 0/100ml. Thus, the actual NPDES permitted point source contribution is likely less than expected by the TMDL.

3.4.4 Load Reduction to Meet Water Quality Criteria

It is important to report the reductions necessary to meet the water quality criteria. The necessary reductions were determined based upon 2007 data, which is considered representative information. The targeted reductions found in Table 3.4.4 provide water quality managers with a quantitative endpoint by which implementation planning can be carried out. The noted reductions along with including the application of point source controls if achieved should result in the waterbodies fully supporting the primary contact recreation beneficial use. The reductions stated in the table also include the margin of safety described below.

The required loading reductions were determined by applying an average reduction to the existing data set to determine what reduction levels would be required to drop the seasonal geometric average below the water quality standard. Table 3.4.4 outlines the targeted reductions which would be required in the impaired segments to meet water quality standards. These loading reductions, if achieved, would result in the listed waters meeting their assigned Primary Contact Recreation beneficial use.

Impaired Segment	E Coli. Reduction Required to meet Water Quality Standards (%)	Expected Seasonal Geometric Average (cfu/100ml)
BB1-10000	58%	113
BB1-10100	47%	112
BB1-10800	24%	113
BB1-20000	92%	113
BB2-10000	90%	103
BB2-20000	90%	108
BB3-10000	94%	102
BB3-20000	95%	101
BB4-10000	86%	109
BB4-20000	86%	109

Table 3.4.4: Targeted *E. coli* Load Reductions

3.4.5 Expression of TMDLs as Daily Loads

The April 25, 2006 decision by the U.S. District Court of Appeals for the D.C. Circuit in "Friends of the Earth, Inc. vs. EPA et. al." recommends that all TMDLs and associated wasteload allocations and load allocations include a daily expression. The approach for these TMDLs will be based upon the conversion of the targeted concentration of *E. coli* to counts per day. The daily expression for each TMDL segment can be found in Appendix C.

4.0 Implementation Plan

The implementation of controls to manage Atrazine and *E. coli* within the Big Blue River watershed includes but is not limited to:

4.1 Nebraska Department of Agriculture

The Nebraska Pesticide Act provides that the Nebraska Department of Agriculture (NDA) shall serve as the lead state agency in matters relating to pesticides as they relate to water quality. It further provides that NDA shall work closely with the Nebraska Department of Environmental Quality, Nebraska Department of Natural Resources, and the Nebraska Department of Health and Human Services in matters relating to water quality.

Since 1995, the NDA has been the lead agency for the regulation of pesticides that might enter or pollute water and is responsible for development and implementation of state management plans for the prevention, evaluation and mitigation of occurrences of pesticides, or pesticide breakdown products, in ground and surface water. By working closely with those state agencies listed above as well as the Natural Resources Districts and others, NDA can be assured that the plans will be more comprehensive and effective in addressing these issues.

The NDA has been consulted in the completion of this TMDL and will be provided a copy upon EPA approval.

4.2 Section 319 - Nonpoint Source Management Program

The United States Environmental Protection Agency supplies grant funds to states to aid in managing nonpoint source pollution. When grant applications are submitted for review, an effort should be made to include the control of Atrazine and surface run-off for the proposed projects in the Big Blue River basin. As well, an effort will be made to redirect applicants to develop proposals consistent with the goals of this TMDL.

4.3 USDA - Natural Resource Conservation Service

The USDA-Natural Resource Conservation Service provides assistance utilizing programs under the control of the Service such as Conservation Reserve Program, Environmental Quality Incentives Program, Conservation Farm Option, Conservation of Private Grazing Land Initiative, the Wetlands Reserve Program and others that aid in the maintenance and improvement of water quality. The TMDL will be forwarded to NRCS for consideration in the implementation of these programs.

4.4 Non-Government Organizations

Several non-governmental organizations with an emphasis on agriculture disseminate information to their members on a regular basis. As well, some of the organizations have established environmental education programs to assist in the understanding of environmental regulations and topics. The NDEQ will communicate with these entities in an attempt to utilize the membership distribution process as a means of providing information on the water quality impairments, the TMDL and suggestions to assist in solving the identified problems.

4.5 NPDES Permitted Point Sources

Facilities that discharge directly to all segments within the Big Blue River basin designated with the primary contact recreation use will be required to meet the wasteload allocations – *E. coli* = 126/100 ml –

at the end of the pipe. Facilities discharging to designated or undesignated tributaries will be evaluated to determine the extent of the effluent's impact on immediate downstream recreation segment. If deemed significant, a request will be made to limit the *E. coli* concentration discharged from these facilities in the NPDES permit. In the course of compliance audits, deficiencies in the operation of the WWTF disinfection appurtenances and noncompliance with the NPDES permit limits should be noted and corrective action pursued.

Biosolids (sludge) generated by municipal and industrial facilities are regulated under 40 CFR Part 257 and 40 CFR Part 503, respectively. 40 CFR part 257 requires that facilities and practices not cause nonpoint source pollution of waters of the United States. Part 503 specifically requires that sludge applications be not less than 10 meters from waters of the United States and that the sludge not be applied to frozen, flooded or snow covered ground if the sludge can enter into waters of the United States.

Consistent with Section 4.7 below, a recommendation will be made that all relevant NPDES permittees adhere to the setback requirements identified in Title 130 Chapter 9 sections 007 for land application activities taking place either during or 10 days prior to the recreation season (May 1 – September 30).

4.6 Dry Weather Discharges

Title 119 – Rules and Regulations pertaining to the Issuance of Permits under the National Pollutant Discharge Elimination System, Chapter 2 states:

> "All persons discharging pollutants from a point source into any waters of the State are required to apply for and have a permit to discharge."

Discharges not permitted should be required to obtain the proper authorization to discharge. All discharges are then subject to the appropriate limitations consistent with the WLAs established by this TMDL. Elimination of the discharge should be undertaken in the event permitting and control is not feasible.

4.7 Animal Feeding Operations

The Livestock Waste Control Program administers two types of permitting programs, under the authority of Title 130 - Livestock Waste Control Regulations, for livestock waste control facilities in Nebraska: The federal National Pollutant Discharge Elimination System (NPDES) permitting program and the state Construction and Operating Permit program. NDEQ Livestock program issues individual NPDES permits, as well as coverage under a General NPDES permit.

Chapter 2, titled "Animal Feeding Operations: Requirements and Prohibitions" states:

> *<u>001</u> Any small animal feeding operation is exempt from the inspection, and construction and operating permit requirements, unless the animal feeding operation has discharged pollutants to waters of the State, or the Department has determined that such a discharge is more likely than not to occur. Operations with animals that are in contact with, or which have direct access to, surface waters, or operations with a man-made ditch, pipe, or other conveyance from the operation to surface waters are considered to be discharging. Animal feeding operations for other species not listed (e.g. bison, elk) that confine animals with a total animal weight of less than 300,000 pounds are considered small animal feeding operations.*

002 Any person owning or operating a large or medium animal feeding operation that does not have a NPDES permit, construction approval, operating permit or construction and operating permit, has not been notified that no permit is required, or any person proposing an expansion or increase to the lot area or feeding area of a large or medium animal feeding operation, shall submit an inspection request to the Department on a form provided by the Department (see Appendix A). The inspection fee established in Chapter 3 shall accompany the inspection request.

003 A livestock waste control facility is required for an existing or proposed animal feeding operation when livestock wastes have discharged or have the potential to discharge in a manner that is not lawfully authorized by permit or these regulations.

004 When livestock waste control facilities are required by the Department, the owner or operator of the animal feeding operation is required to apply for construction and operating permit as provided in Chapter 4. In the case of an existing animal feeding operation, the owner or operator will be notified in writing following an inspection by the Department whether or not a facility is required and, if required, the applicant shall submit an application according to the compliance dates in the notification.

And,

008 Any person who owns or operates an animal feeding operation shall not:

008.01 Provide or present false or misleading information to the Department or omit relevant facts when submitting reports or applications to the Department;

008.02 Allow livestock at an animal feeding operation to come into direct contact with waters of the State, apply livestock waste on or into waters of the State, or to otherwise allow or cause a discharge;

008.03 Apply manure, litter, or process wastewater to land in a manner that results in a discharge to waters of the State or that is not in accordance with nutrient management practices that ensure appropriate agricultural utilization of the nutrients in the manure, litter, or process wastewater;

008.04 Stockpile livestock waste in a drainage way or other location where it is likely to impact waters of the State;

Chapter 8, titled “Waste Control Methods: Design Criteria and Construction Requirements” also states:

002.01 For open lot animal feeding operations, the minimum storage period capacity shall be no less than the calculated average runoff for the month of June, runoff from a 25-year, 24-hour rainfall event, and any manure, litter, and process wastewater produced for the month of June.

002.02 The minimum storage period for totally housed operations shall be no less than 180 days. Except, the applicant may request the Director to establish a substantially equivalent alternative storage period which is less than 180 days based upon a satisfactory demonstration that the proposed alternative time period will achieve overall

environmental performance which is at least equal to that achieved by providing adequate storage for the specified 180 days. The Director may require any additional supporting information deemed necessary to support such a request.

005 Surface drainage shall be diverted around the production area and livestock waste control facility to the maximum extent possible by diversion terrace, berm, ditch, or similar diversion, subject to Department approval. Any such diversion shall be designed and constructed to convey all runoff or at least the runoff and the direct precipitation from the peak discharge of a 25-year, 24-hour rainfall event (whichever criterion is applicable as identified in Chapter 7). Any open diversion will not be less than 1.5 feet in channel depth.

Meeting these regulation requirements should equate to "zero" discharge during conditions less than a 25 year 24 hour precipitation event, or a chronic wet period.

Wastewater and biosolids (manure) produced by the animal feeding operations are most often land applied for beneficial reuse. Permitted facilities are required to follow stockpile and application setbacks identified in Title 130 Chapter 9.

007 For large concentrated animal feeding operations, manure, litter, and process wastewater may not be stockpiled or applied closer than 100 feet to any down-gradient surface waters, open tile line intake structures, well heads, or other conduits to surface or ground water, except that one of the following two compliance alternatives may be substituted for the application setback requirement:

007.01 A 35-foot-wide vegetated buffer where the application of manure, litter, or process wastewater is prohibited. For the purposes of these regulations vegetated buffer means a permanent strip of dense perennial vegetation established parallel to the contours of and perpendicular to the dominant slope of the field for the purposes of slowing water runoff, enhancing water infiltration, and minimizing the risk of any potential nutrients or pollutants from leaving the field and reaching surface waters of the state; or

007.02 A satisfactory demonstration that a setback or buffer is not necessary because implementation of alternative conservation practices will provide pollutant reductions equal to or better than reductions that would be achieved by the 100-foot setback.

008 For small and medium concentrated animal feeding operations and animal feeding operations not required to seek permit coverage, manure, litter, and process wastewater may not be stockpiled or applied closer than 30 feet of any streams, lakes and impounded waters identified in Chapter 6 and Chapter 7 of Title 117 (Nebraska Administrative Code) – Nebraska Surface Water Quality Standards, unless in accordance with a Department approved nutrient management plan.

Permitted facilities are also required to follow best management practices (BMPs) for the land application of livestock wastes as defined in Title 130, Chapter 11, and those BMPs include:

001 Animal feeding operations and livestock waste control facilities shall be operated and maintained to prevent water pollution and to protect the environment of the State. Best management practices shall be implemented using the most effective methods based on the best

available technology achievable for specific sites to prevent or reduce the discharge of pollutants to waters of the State and control odor where appropriate.

And,

005 All livestock wastes removed from the facility and the animal feeding operation itself shall be land applied or stockpiled in a manner which will not contribute to water pollution. The owner or authorized representative shall remain responsible for wastes removed from the operation to land under his or her control.

Based upon the above regarding land application, it shall be recommended that the NDEQ's Agriculture Section stipulate in the state operating or other permits, for facilities located in the Big Blue River basin, that the application of livestock waste occurring 10 days prior or during the Recreation Season (May 1 – September 30) be consistent with Title 130 Chapter 9 sections 007 and 008 mentioned above with the inclusion of streams identified in Chapter 5 of Title 117. In addition, a recommendation will be made to the NDEQ's Agriculture Section that the application setback be the minimum of 30 feet regardless of the status of the comprehensive nutrient management plan for all small and medium concentrated animal feeding operations. And finally, for all small and medium concentrated animal feeding operations, in those areas where land slope or drainage is such where the application has a greater potential to run-off, or where application has been observed to have run-off, the recommendation will be a minimum setback of 100 feet, or complying with sections 007.01 and 007.02 of Title 130 Chapter 9.

A list of the identification numbers for all the Animal Feeding Operations in the Big Blue River basin are listed by county in Appendix D.

4.8 Exempt Facilities/Other Agricultural Sources

Animal feeding operations are exempt from regulations set forth in Title 130 if:

- The operation is classified as a small animal feeding operation, and
- There has not been a confirmed discharge to waters of the State, and/or
- The Department has determined that because of conditions at the livestock operation there is not a high potential for discharge to waters of the state.

Periodically, the NDEQ will receive a complaint on or a request for an inspection from a facility operating as a small animal feeding operation. Should deficiencies be noted during the on-site visit, the owners/operator will often be given an opportunity to make corrections prior to enforcement or permit action being taken. In the event the efforts at voluntary compliance fail, civil enforcement or the issuance of a permit will be pursued to bring about the necessary corrective measures.

Because these facilities are "non-regulated", it is difficult to assess the impacts to the environment. As well, pastures or other temporary feeding practices may contribute to the *E. coli* impairments if conditions are such that run-off from the site occurs. In lieu of regulatory requirements, the NDEQ will first look to the USDA-Natural Resource Conservation Service for assistance utilizing programs under the control of the Service such as Conservation Reserve Program, Environmental Quality Incentives Program, Conservation Farm Option, Conservation of Private Grazing Land Initiative, the Wetlands Reserve Program and others that aid in the maintenance and improvement of water quality.

4.9 Reasonable Assurance

As stated above, the NDA is the lead agency that deals with pesticide water quality issues. This TMDL was provided to the NDA prior to submittal to EPA for approval/disapproval. Once approved, coordination with the NDA will continue, including data collection and prioritization and nonpoint source program administration.

The NDEQ is responsible for the issuance of NPDES or state operating permits for industrial and municipal wastewater discharges, regulated stormwater discharges and livestock operations (open lot or confined). Issued permits must be consistent with or more stringent then the wasteload allocations set forth by this TMDL. Compliance with the permit may require construction or modification of a facility and the issued permits may account for this through the inclusion of a compliance schedule or administrative order.

Effective management of nonpoint source pollution in Nebraska necessarily requires a cooperative and coordinated effort by many agencies and organizations, both public and private. Each organization is uniquely equipped to deliver specific services and assistance to the citizens of Nebraska to help reduce the effects of nonpoint source pollution on the State's water resources. While a few of the organizations have been previously identified, Appendix A contains a more complete compilation of those entities that may be included in the implementation process. These agencies have been identified as being responsible for program oversight or fund allocation that may be useful in addressing and reducing Atrazine and *E. coli* contributions to the Big Blue River basin. Participation will depend on the agency/organization's program capabilities.

5.0 Future Monitoring

Future monitoring will generally be consistent with the ambient monitoring and rotating basin monitoring programs. The Big Blue River Basin was monitored in 2002, 2007 and most recently in 2012. The 2012 data was not available during the development of this document; therefore the 2007 data was used to readdress the original *E. coli* TMDL approved by EPA in 2005 and to expand the TMDL to cover other E. *coli* and Atrazine impairments identified in 2007. NDEQ expanded its basin rotation monitoring program from once every five years to once every six years to cover more streams and lakes. NDEQ will target this basin again in 2018. An effort will be made to expand the monitoring to isolate areas of concern and to focus resources to address identified problems.

6.0 Public Participation

The availability of the TMDLs in draft form was published on NDEQ's Internet site with the public comment period running from July 8**,** 2013 to August 7**,** 2013. Interested stakeholders (Appendix A) were also informed via email of the availability of the draft TMDLs. In response to the public notice, comments were received from both the Upper Big Blue NRD and NDEQ's Agriculture Section. The Comments were reviewed and appropriate changes were made to the TMDLs as a result of the correspondence. Copies of the comments and the NDEQ's response to those comments have been included with the submittal to EPA Region 7.

6.0 References

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Appendix A

Federal, State Agency and Private Organizations Included in TMDL Implementation.

FEDERAL
- Bureau of Reclamation
- Environmental Protection Agency
- Fish and Wildlife Service
- Geological Survey
- Department of Agriculture - Farm Services Agency
- Department of Agriculture - Natural Resources Conservation Service

STATE
- Nebraska Association of Resources Districts
- Department of Agriculture
- Department of Environmental Quality
- Department of Roads
- Department of Water Resources
- Department of Health and Human Services
- Environmental Trust
- Game and Parks Commission
- Natural Resources Commission
- University of Nebraska Institute of Agriculture and Natural Resources (IANR)
- UN-IANR: Agricultural Research Division
- UN-IANR: Cooperative Extension Division
- UN-IANR: Conservation and Survey Division
- UN-IANR: Nebraska Forest Service
- UN-IANR: Water Center and Environmental Programs

LOCAL
- Natural Resources Districts
- County Governments (Zoning Board)
- City/Village Governments

NON-GOVERNMENTAL ORGANIZATIONS
- Nebraska Wildlife Federation
- Pheasants Forever
- Nebraska Water Environment Association
- Nebraska Corn Growers Association, Wheat Growers, etc.
- Nebraska Cattlemen’s Association, Pork Producers, etc
- Other specialty interest groups
- Local Associations (i.e. homeowners associations)

Appendix B

Example of Maximum Daily Loadings for May - June Atrazine at various Big Blue River flow for the impaired segments. Again, given the usage and source of Atrazine, point and natural sources are likely not contributing to surface waters in Nebraska. Consequently the WLA and Natural Background for this TMDL are set at zero (0). The entire load below is therefore considered the Load Allocation.

Percent of Flow Exceed		100	90	80	70	60	50	40	30	20	10	0
Flow Percentile		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
BB1-10000	Flow (cfs)	94	281	370	519	678	877	1153	1737	2842	4878	24174
WQS = 12 µg/l	TMDL (lb/day)	6.06	18.18	23.9	33.51	43.76	56.66	74.45	112.2	183.55	315.04	1561.4
BB1-10100	Flow (cfs)	0	2	2	3	4	5	8	12	22	51	524
WQS = 12 µg/l	TMDL (lb/day)	0.01	0.11	0.16	0.2	0.26	0.32	0.5	0.76	1.43	3.29	33.86
BB1-10800	Flow (cfs)	0	6	9	11	15	19	28	42	78	177	1896
WQS = 12 µg/l	TMDL (lb/day)	0.03	0.39	0.58	0.73	0.94	1.21	1.79	2.73	5.04	11.44	122.43
BB1-10900	Flow (cfs)	0	4	6	8	10	13	19	29	53	121	1291
WQS = 12 µg/l	TMDL (lb/day)	0.02	0.27	0.39	0.5	0.64	0.83	1.22	1.86	3.43	7.79	83.36
BB1-20000	Flow (cfs)	40	158	197	229	279	332	422	599	962	1878	11648
WQS = 12 µg/l	TMDL (lb/day)	2.55	10.21	12.7	14.79	18	21.43	27.27	38.68	62.12	121.31	752.33
BB2-10000	Flow (cfs)	10	18	30	39	50	66	95	157	286	743	7390
WQS = 12 µg/l	TMDL (lb/day)	0.61	1.16	1.94	2.52	3.23	4.26	6.14	10.17	18.47	47.98	477.31
BB2-20000	Flow (cfs)	1	13	20	25	32	39	61	94	175	404	4154
WQS = 12 µg/l	TMDL (lb/day)	0.06	0.86	1.26	1.6	2.06	2.53	3.93	6.05	11.31	26.08	268.3
BB3-10000	Flow (cfs)	34	71	88	101	114	132	158	205	331	626	7875
WQS = 12 µg/l	TMDL (lb/day)	2.17	4.61	5.7	6.51	7.37	8.55	10.2	13.22	21.39	40.42	508.62
BB3-10300	Flow (cfs)	5	12	14	16	18	21	26	33	54	101	1275
WQS = 12 µg/l	TMDL (lb/day)	0.35	0.75	0.92	1.05	1.19	1.38	1.65	2.14	3.46	6.54	82.35
BB3-20000	Flow (cfs)	21	46	56	64	73	84	101	131	211	399	5025
WQS = 12 µg/l	TMDL (lb/day)	1.38	2.94	3.64	4.15	4.7	5.45	6.51	8.44	13.65	25.79	324.55
BB4-10000	Flow (cfs)	5	32	57	72	84	98	115	145	233	633	12380
WQS = 12 µg/l	TMDL (lb/day)	0.3	2.05	3.7	4.64	5.45	6.3	7.41	9.38	15.13	40.87	799.64
BB4-20800	Flow (cfs)	9	16	23	28	31	35	39	52	82	213	3478
WQS = 12 µg/l	TMDL (lb/day)	0.56	1.03	1.49	1.81	2	2.26	2.52	3.36	5.3	13.73	224.64
BB4-40000	Flow (cfs)	0	1	2	4	6	9	11	20	35	108	5469
WQS = 12 µg/l	TMDL (lb/day)	0	0.04	0.13	0.25	0.41	0.55	0.7	1.27	2.25	7.01	353.27

Table B1: Percentile flows and Maximum Daily Atrazine Loading for the Big Blue River

Appendix C

Loading capacities and wasteload allocations will be expressed as daily counts using the following equations:

$$Q \times 35683.2 \text{ colony forming unit (cfu)}/ft^3 \times 86400 \text{ seconds/day}$$

Daily expression of the margin of safety will be 10% of the loading capacity. The load allocation will be the remaining load available after accounting for the wasteload allocation and the margin of safety. The tables and charts below are the daily expressions for the TMDLs contained in this document.

Percent Exceedance	Loading Capacity (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
100%	5.66E+10	5.17E+10	0.00E+00	5.66E+09
90%	4.31E+11	5.17E+10	3.36E+11	4.31E+10
80%	7.04E+11	5.17E+10	5.82E+11	7.04E+10
70%	9.37E+11	5.17E+10	7.92E+11	9.37E+10
60%	1.18E+12	5.17E+10	1.01E+12	1.18E+11
50%	1.60E+12	5.17E+10	1.39E+12	1.60E+11
40%	2.21E+12	5.17E+10	1.94E+12	2.21E+11
30%	3.12E+12	5.17E+10	2.76E+12	3.12E+11
20%	5.08E+12	5.17E+10	4.52E+12	5.08E+11
10%	1.00E+13	5.17E+10	8.95E+12	1.00E+12
0%	9.75E+13	5.17E+10	8.77E+13	9.75E+12

Table C1: Daily TMDL Expression from BB1-10000

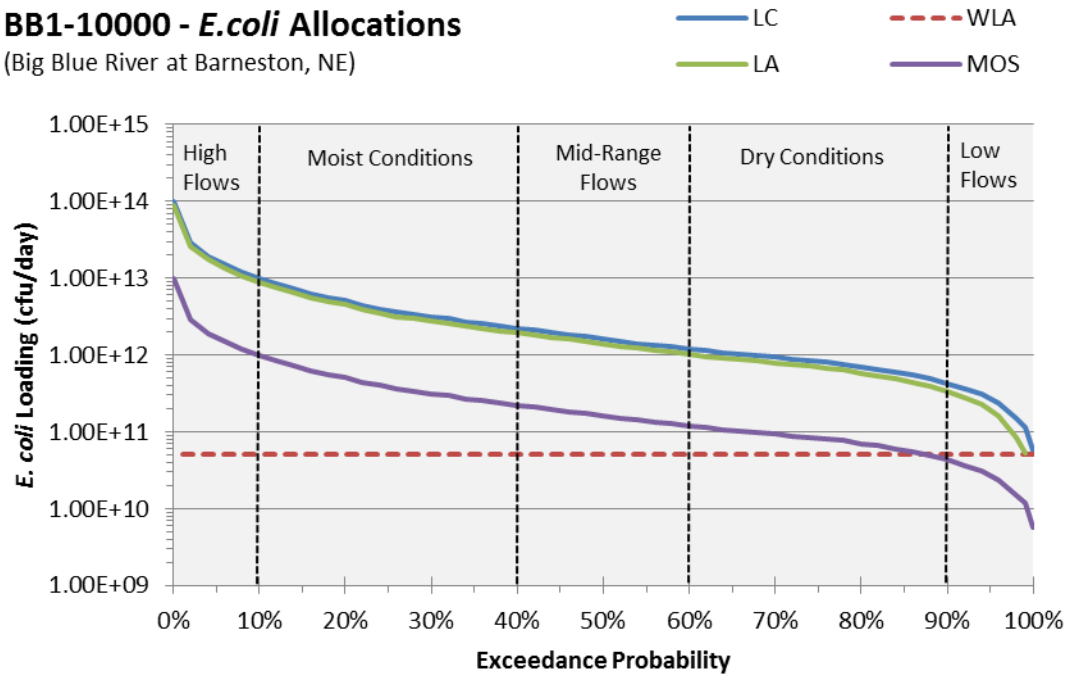

Figure C1: BB1-10000 Daily Load Expression Chart

Percent Exceedance	Loading Capacity (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
100%	4.02E+06	0.00E+00	3.62E+06	4.02E+05
90%	5.21E+08	0.00E+00	4.69E+08	5.21E+07
80%	2.00E+09	0.00E+00	1.80E+09	2.00E+08
70%	4.41E+09	0.00E+00	3.97E+09	4.41E+08
60%	6.81E+09	0.00E+00	6.13E+09	6.81E+08
50%	9.22E+09	0.00E+00	8.30E+09	9.22E+08
40%	1.28E+10	0.00E+00	1.15E+10	1.28E+09
30%	1.88E+10	0.00E+00	1.70E+10	1.88E+09
20%	3.37E+10	0.00E+00	3.03E+10	3.37E+09
10%	9.02E+10	0.00E+00	8.12E+10	9.02E+09
0%	1.66E+12	0.00E+00	1.49E+12	1.66E+11

Table C2: Daily TMDL Expression from BB1-10100

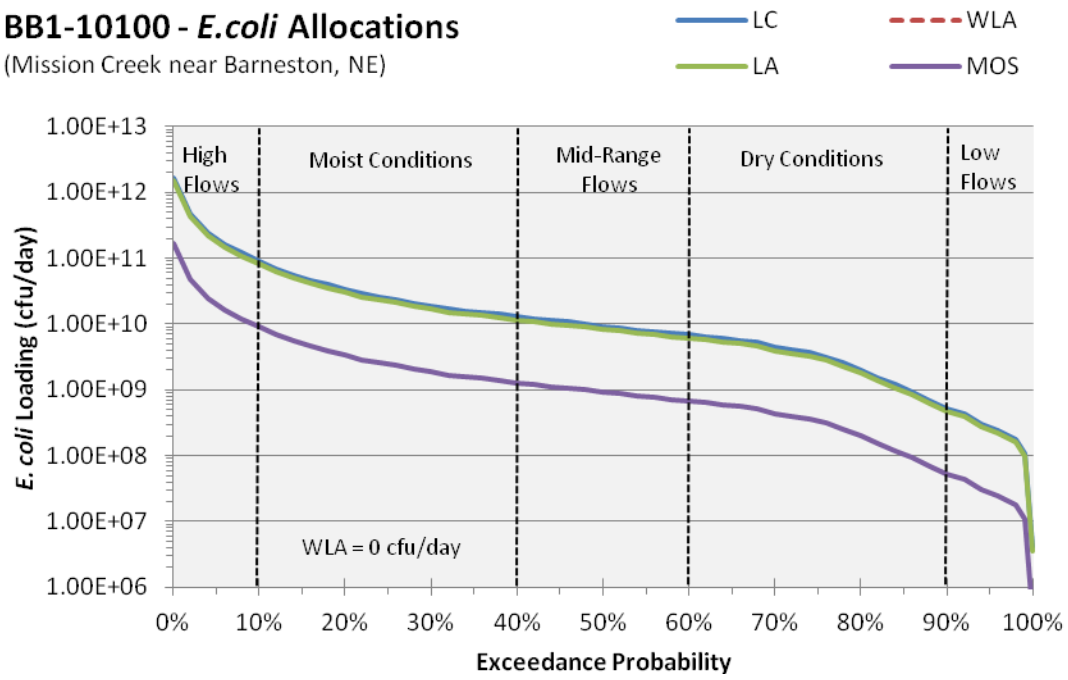

Figure C2: BB1-10100 Daily Load Expression Chart

Percent Exceedance	Loading Capacity (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
100%	1.45E+07	3.77E+08	0.00E+00	1.45E+06
90%	1.88E+09	3.77E+08	1.32E+09	1.88E+08
80%	7.25E+09	3.77E+08	6.14E+09	7.25E+08
70%	1.59E+10	3.77E+08	1.40E+10	1.59E+09
60%	2.46E+10	3.77E+08	2.18E+10	2.46E+09
50%	3.33E+10	3.77E+08	2.96E+10	3.33E+09
40%	4.64E+10	3.77E+08	4.14E+10	4.64E+09
30%	6.81E+10	3.77E+08	6.09E+10	6.81E+09
20%	1.22E+11	3.77E+08	1.09E+11	1.22E+10
10%	3.26E+11	3.77E+08	2.93E+11	3.26E+10
0%	6.00E+12	3.77E+08	5.40E+12	6.00E+11

Table C3: Daily TMDL Expression from BB1-10800

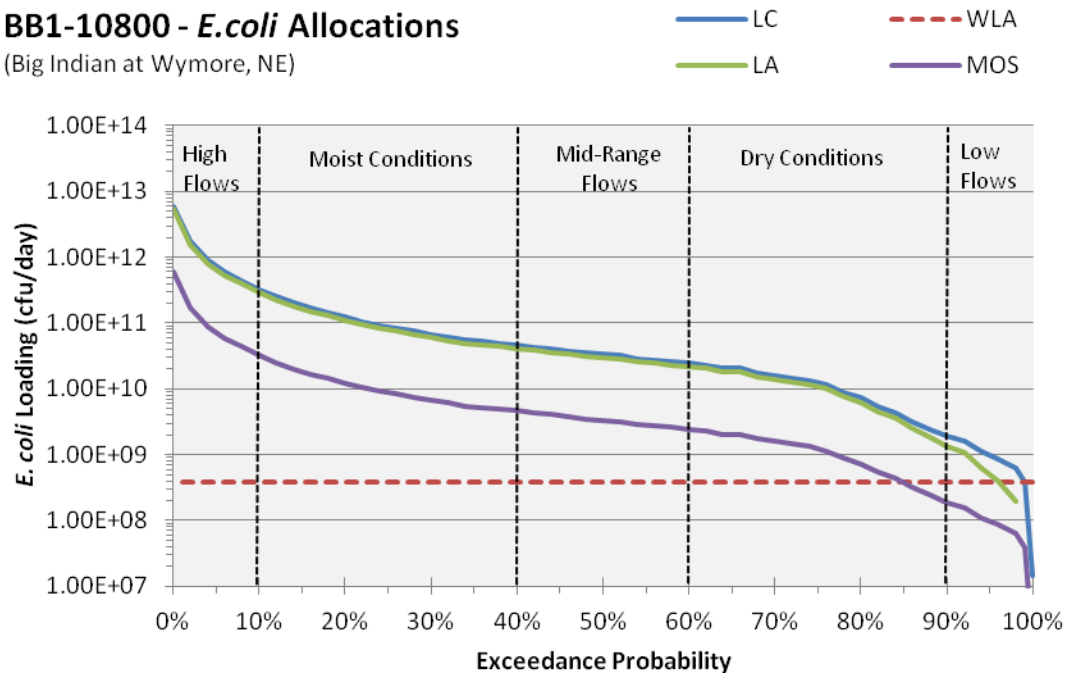

Figure C3: BB1-10800 Daily Load Expression Chart

Percent Exceedance	Loading Capacity (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
100%	3.85E+10	3.68E+10	0.00E+00	3.85E+09
90%	2.60E+11	3.68E+10	1.97E+11	2.60E+10
80%	4.07E+11	3.68E+10	3.30E+11	4.07E+10
70%	5.26E+11	3.68E+10	4.36E+11	5.26E+10
60%	6.38E+11	3.68E+10	5.37E+11	6.38E+10
50%	7.70E+11	3.68E+10	6.56E+11	7.70E+10
40%	9.81E+11	3.68E+10	8.46E+11	9.81E+10
30%	1.32E+12	3.68E+10	1.15E+12	1.32E+11
20%	1.97E+12	3.68E+10	1.74E+12	1.97E+11
10%	3.98E+12	3.68E+10	3.54E+12	3.98E+11
0%	4.04E+13	3.68E+10	3.63E+13	4.04E+12

Table C4: Daily TMDL Expression from BB1-20000

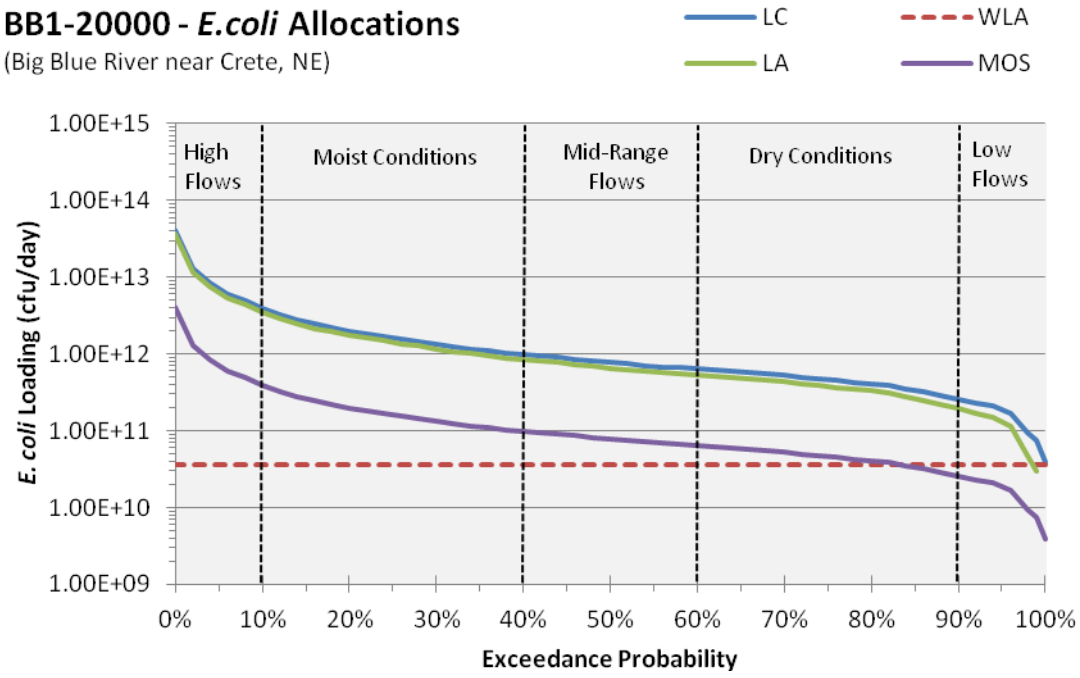

Figure C4: BB1-20000 Daily Load Expression Chart

Percent Exceedance	Loading Capacity (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
100%	1.91E+09	3.85E+09	0.00E+00	1.91E+08
90%	2.68E+10	3.85E+09	2.03E+10	2.68E+09
80%	4.01E+10	3.85E+09	3.22E+10	4.01E+09
70%	5.55E+10	3.85E+09	4.61E+10	5.55E+09
60%	7.71E+10	3.85E+09	6.55E+10	7.71E+09
50%	1.08E+11	3.85E+09	9.33E+10	1.08E+10
40%	1.54E+11	3.85E+09	1.35E+11	1.54E+10
30%	2.31E+11	3.85E+09	2.04E+11	2.31E+10
20%	4.06E+11	3.85E+09	3.61E+11	4.06E+10
10%	1.09E+12	3.85E+09	9.79E+11	1.09E+11
0%	2.28E+13	3.85E+09	2.05E+13	2.28E+12

Table C5: Daily TMDL Expression from BB2-10000

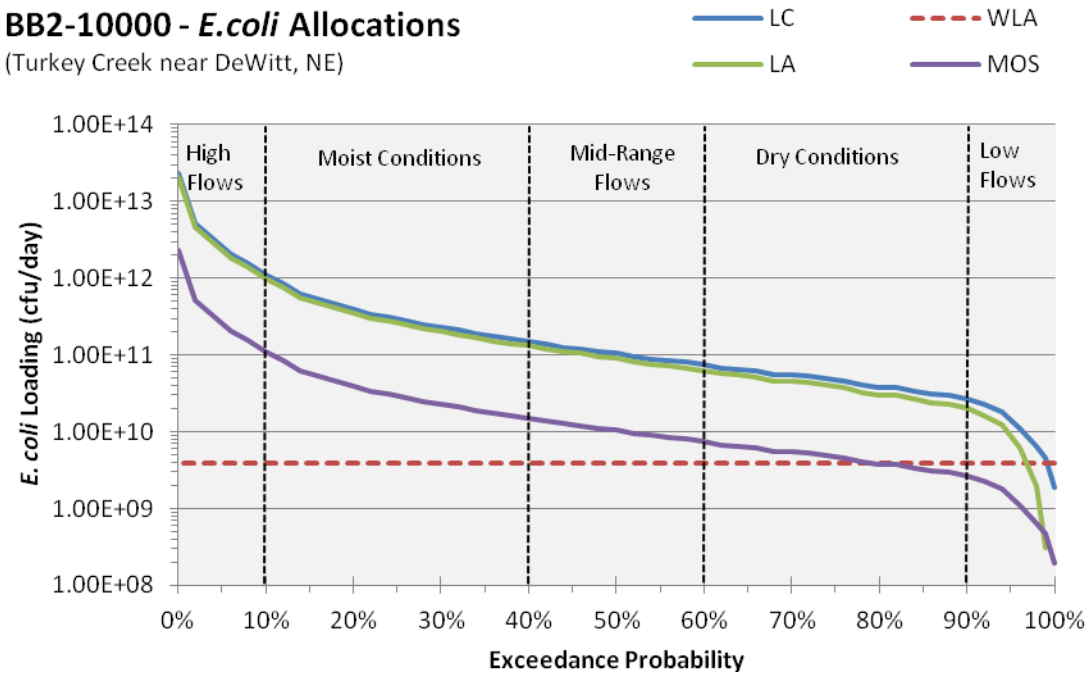

Figure C5: BB2-10000 Daily Load Expression Chart

Percent Exceedance	Loading Capacity (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
100%	3.18E+07	3.64E+09	0.00E+00	3.18E+06
90%	4.13E+09	3.64E+09	7.54E+07	4.13E+08
80%	1.59E+10	3.64E+09	1.06E+10	1.59E+09
70%	3.49E+10	3.64E+09	2.78E+10	3.49E+09
60%	5.40E+10	3.64E+09	4.49E+10	5.40E+09
50%	7.30E+10	3.64E+09	6.21E+10	7.30E+09
40%	1.02E+11	3.64E+09	8.78E+10	1.02E+10
30%	1.49E+11	3.64E+09	1.31E+11	1.49E+10
20%	2.67E+11	3.64E+09	2.36E+11	2.67E+10
10%	7.14E+11	3.64E+09	6.39E+11	7.14E+10
0%	1.31E+13	3.64E+09	1.18E+13	1.31E+12

Table C6: Daily TMDL Expression from BB2-20000

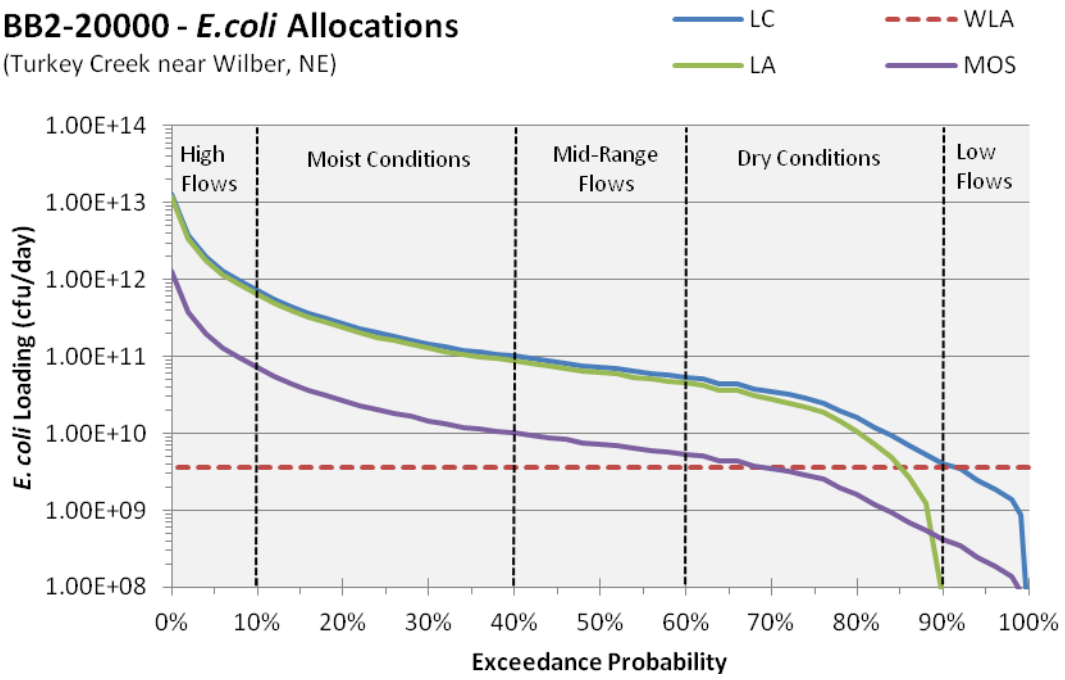

Figure C6: BB2-20000 Daily Load Expression Chart

Percent Exceedance	Loading Capacity (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
100%	4.21E+10	1.51E+10	2.28E+10	4.21E+09
90%	1.81E+11	1.51E+10	1.48E+11	1.81E+10
80%	2.33E+11	1.51E+10	1.95E+11	2.33E+10
70%	2.65E+11	1.51E+10	2.24E+11	2.65E+10
60%	3.01E+11	1.51E+10	2.56E+11	3.01E+10
50%	3.54E+11	1.51E+10	3.04E+11	3.54E+10
40%	4.21E+11	1.51E+10	3.64E+11	4.21E+10
30%	5.31E+11	1.51E+10	4.63E+11	5.31E+10
20%	7.64E+11	1.51E+10	6.72E+11	7.64E+10
10%	1.40E+12	1.51E+10	1.25E+12	1.40E+11
0%	2.43E+13	1.51E+10	2.18E+13	2.43E+12

Table C7: Daily TMDL Expression from BB3-10000

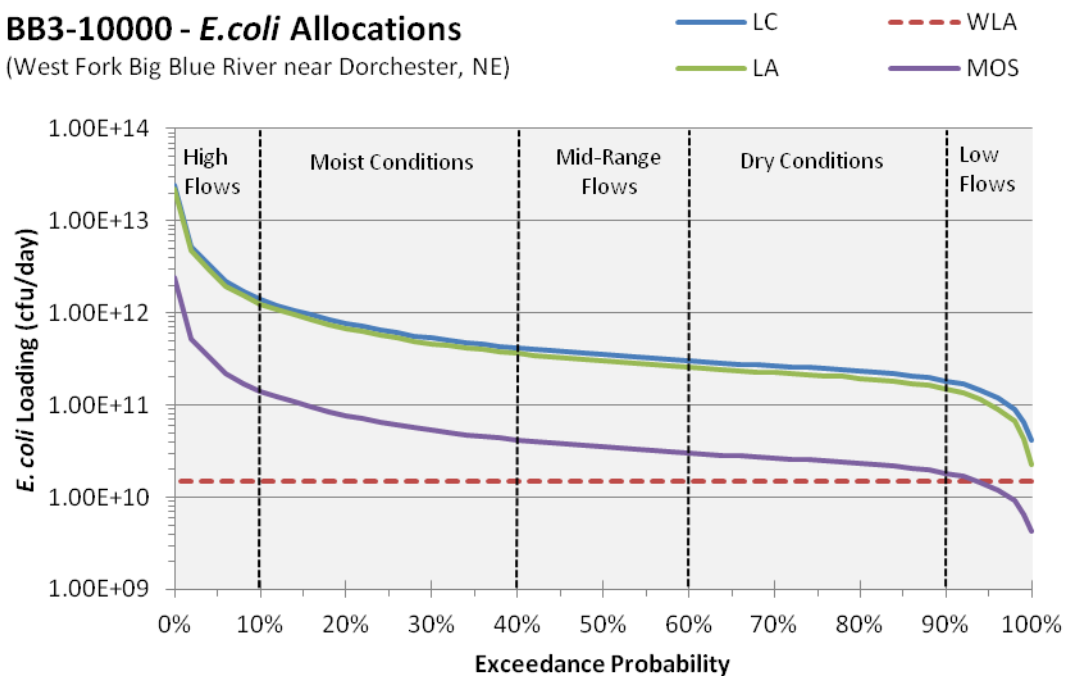

Figure C7: BB3-10000 Daily Load Expression Chart

Percent Exceedance	Loading Capacity (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
100%	2.69E+10	2.48E+08	2.39E+10	2.69E+09
90%	1.16E+11	2.48E+08	1.04E+11	1.16E+10
80%	1.49E+11	2.48E+08	1.34E+11	1.49E+10
70%	1.69E+11	2.48E+08	1.52E+11	1.69E+10
60%	1.92E+11	2.48E+08	1.73E+11	1.92E+10
50%	2.26E+11	2.48E+08	2.03E+11	2.26E+10
40%	2.69E+11	2.48E+08	2.41E+11	2.69E+10
30%	3.39E+11	2.48E+08	3.05E+11	3.39E+10
20%	4.87E+11	2.48E+08	4.38E+11	4.87E+10
10%	8.95E+11	2.48E+08	8.05E+11	8.95E+10
0%	1.55E+13	2.48E+08	1.39E+13	1.55E+12

Table C8: Daily TMDL Expression from BB3-20000

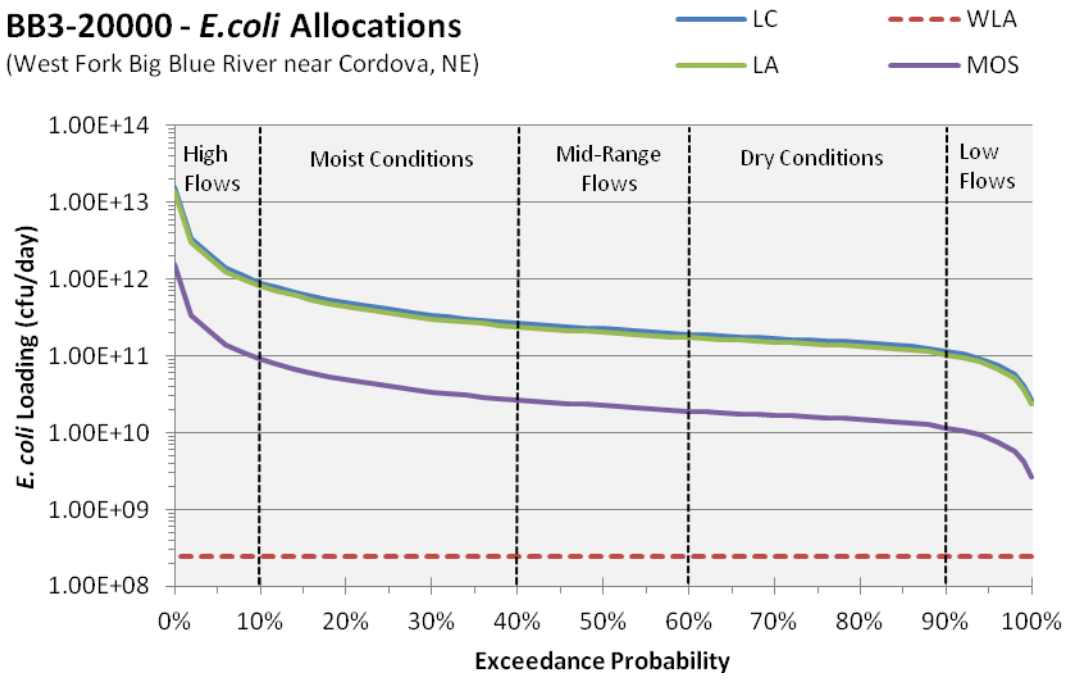

Figure C8: BB3-20000 Daily Load Expression Chart

Percent Exceedance	Loading Capacity (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
100%	6.40E+09	2.08E+10	0.00E+00	6.40E+08
90%	4.78E+10	2.08E+10	2.22E+10	4.78E+09
80%	8.27E+10	2.08E+10	5.37E+10	8.27E+09
70%	1.17E+11	2.08E+10	8.41E+10	1.17E+10
60%	1.62E+11	2.08E+10	1.25E+11	1.62E+10
50%	2.03E+11	2.08E+10	1.62E+11	2.03E+10
40%	2.60E+11	2.08E+10	2.13E+11	2.60E+10
30%	3.23E+11	2.08E+10	2.70E+11	3.23E+10
20%	4.54E+11	2.08E+10	3.87E+11	4.54E+10
10%	9.50E+11	2.08E+10	8.34E+11	9.50E+10
0%	3.82E+13	2.08E+10	3.43E+13	3.82E+12

Table C9: Daily TMDL Expression from BB4-10000

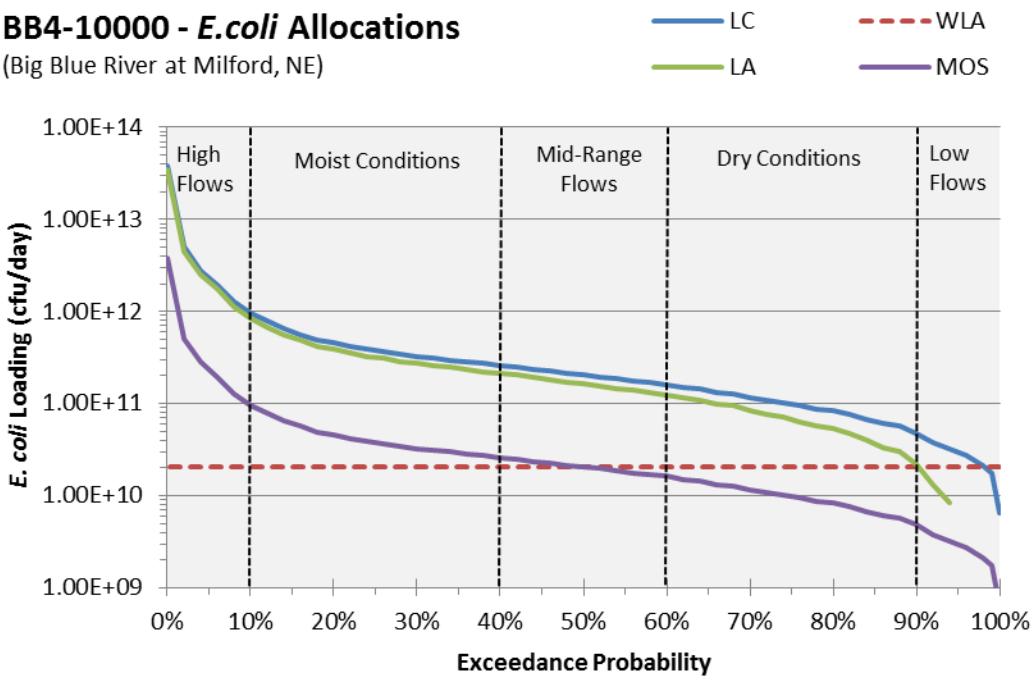

Figure C9: BB4-10000 Daily Load Expression Chart

Percent Exceedance	Loading Capacity (cfu/day)	WLA (cfu/day)	LA (cfu/day)	MOS (cfu/day)
100%	6.34E+09	2.08E+10	0.00E+00	6.34E+08
90%	4.74E+10	2.08E+10	2.18E+10	4.74E+09
80%	8.21E+10	2.08E+10	5.31E+10	8.21E+09
70%	1.16E+11	2.08E+10	8.33E+10	1.16E+10
60%	1.60E+11	2.08E+10	1.24E+11	1.60E+10
50%	2.01E+11	2.08E+10	1.61E+11	2.01E+10
40%	2.57E+11	2.08E+10	2.11E+11	2.57E+10
30%	3.21E+11	2.08E+10	2.68E+11	3.21E+10
20%	4.50E+11	2.08E+10	3.84E+11	4.50E+10
10%	9.42E+11	2.08E+10	8.27E+11	9.42E+10
0%	3.79E+13	2.08E+10	3.40E+13	3.79E+12

Table C10: Daily TMDL Expression from BB4-20000

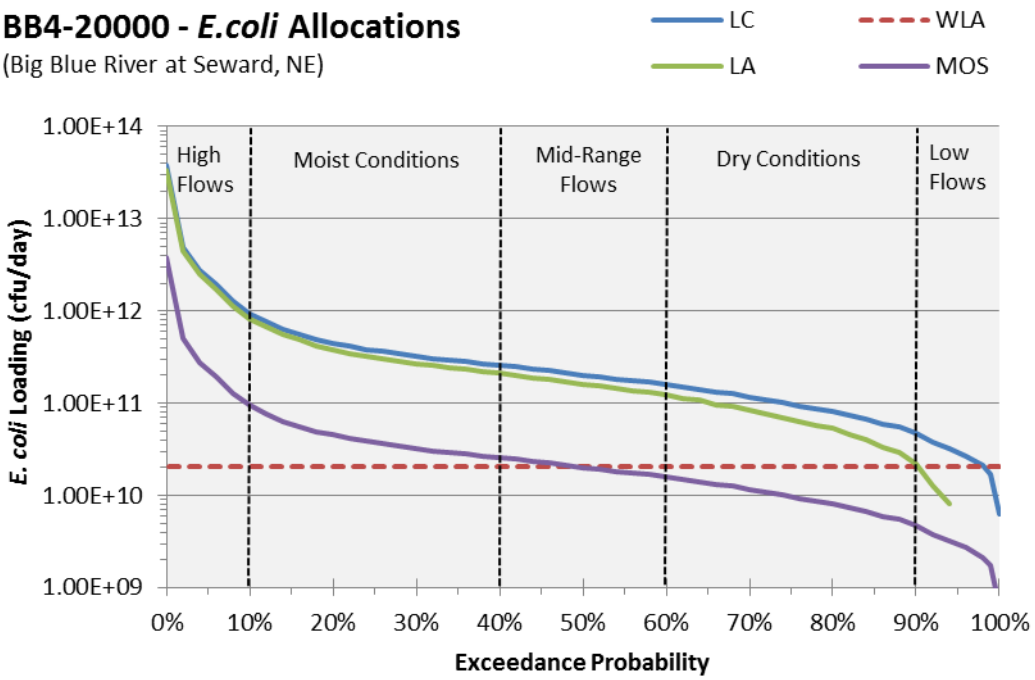

Figure C10: BB4-20000 Daily Load Expression Chart

Appendix D

This data was extracted from NDEQ's IMS website on April 16, 2013 and lists all active Animal Feeding Operations within the Big Blue River Basin.

Facility	County	Facility	County	Facility	County	Facility	County
71377	Adams	75314	Butler	66217	Clay	79330	Clay
74448	Adams	75986	Butler	66219	Clay	79331	Clay
75198	Adams	78493	Butler	66221	Clay	79334	Clay
75206	Adams	78495	Butler	66224	Clay	79336	Clay
75210	Adams	78497	Butler	66225	Clay	79480	Clay
77675	Adams	78498	Butler	66228	Clay	79481	Clay
79242	Adams	78503	Butler	66229	Clay	81547	Clay
79288	Adams	78504	Butler	66230	Clay	89708	Clay
79298	Adams	78508	Butler	71375	Clay	90516	Clay
79300	Adams	78510	Butler	72691	Clay	92812	Clay
79483	Adams	78515	Butler	74200	Clay	22206	Fillmore
87016	Adams	78517	Butler	74885	Clay	66745	Fillmore
4040	Butler	78521	Butler	74910	Clay	66748	Fillmore
66623	Butler	78721	Butler	75225	Clay	66750	Fillmore
66625	Butler	81468	Butler	75228	Clay	66754	Fillmore
66627	Butler	85386	Butler	75229	Clay	66755	Fillmore
66630	Butler	85862	Butler	75230	Clay	66756	Fillmore
66632	Butler	86501	Butler	75232	Clay	66757	Fillmore
66636	Butler	86683	Butler	75233	Clay	66759	Fillmore
66637	Butler	87471	Butler	75239	Clay	66761	Fillmore
66638	Butler	87993	Butler	75243	Clay	66763	Fillmore
66639	Butler	87994	Butler	75246	Clay	66764	Fillmore
66640	Butler	88119	Butler	75252	Clay	66767	Fillmore
66642	Butler	92129	Butler	75253	Clay	66773	Fillmore
66647	Butler	98019	Butler	75255	Clay	66775	Fillmore
66651	Butler	817	Clay	75585	Clay	66778	Fillmore
66655	Butler	6113	Clay	79224	Clay	66779	Fillmore
66658	Butler	54927	Clay	79226	Clay	66781	Fillmore
66685	Butler	64734	Clay	79237	Clay	66782	Fillmore
66689	Butler	66180	Clay	79238	Clay	66785	Fillmore
66691	Butler	66181	Clay	79240	Clay	66791	Fillmore
66692	Butler	66183	Clay	79276	Clay	66793	Fillmore
66694	Butler	66184	Clay	79277	Clay	66796	Fillmore
66720	Butler	66187	Clay	79279	Clay	66797	Fillmore
70904	Butler	66189	Clay	79282	Clay	66800	Fillmore
72259	Butler	66190	Clay	79283	Clay	66802	Fillmore
73677	Butler	66191	Clay	79287	Clay	66803	Fillmore
74268	Butler	66192	Clay	79290	Clay	66806	Fillmore
75289	Butler	66193	Clay	79308	Clay	66807	Fillmore
75293	Butler	66196	Clay	79310	Clay	66810	Fillmore
75296	Butler	66197	Clay	79312	Clay	66813	Fillmore
75299	Butler	66199	Clay	79315	Clay	66815	Fillmore
75301	Butler	66200	Clay	79317	Clay	66818	Fillmore
75302	Butler	66201	Clay	79320	Clay	66821	Fillmore
75304	Butler	66202	Clay	79321	Clay	66822	Fillmore
75307	Butler	66212	Clay	79326	Clay	66825	Fillmore

Facility	County	Facility	County	Facility	County	Facility	County
66826	Fillmore	79496	Fillmore	68527	Gage	68577	Gage
66829	Fillmore	79497	Fillmore	68529	Gage	68578	Gage
66830	Fillmore	79499	Fillmore	68530	Gage	68579	Gage
66831	Fillmore	79500	Fillmore	68531	Gage	68580	Gage
66832	Fillmore	79501	Fillmore	68532	Gage	68581	Gage
66833	Fillmore	79502	Fillmore	68533	Gage	68582	Gage
69240	Fillmore	79504	Fillmore	68534	Gage	68583	Gage
69241	Fillmore	79506	Fillmore	68536	Gage	68584	Gage
72167	Fillmore	79507	Fillmore	68537	Gage	68585	Gage
72232	Fillmore	79508	Fillmore	68538	Gage	68587	Gage
72237	Fillmore	79509	Fillmore	68539	Gage	68588	Gage
72261	Fillmore	79511	Fillmore	68540	Gage	68589	Gage
72262	Fillmore	79512	Fillmore	68541	Gage	68590	Gage
73723	Fillmore	79516	Fillmore	68542	Gage	68591	Gage
74196	Fillmore	79517	Fillmore	68543	Gage	68592	Gage
74353	Fillmore	79518	Fillmore	68544	Gage	68594	Gage
74714	Fillmore	79519	Fillmore	68545	Gage	68595	Gage
75327	Fillmore	79685	Fillmore	68546	Gage	68596	Gage
76518	Fillmore	79686	Fillmore	68547	Gage	68597	Gage
76519	Fillmore	79689	Fillmore	68548	Gage	68598	Gage
76523	Fillmore	82968	Fillmore	68549	Gage	68600	Gage
76526	Fillmore	82969	Fillmore	68550	Gage	68601	Gage
76527	Fillmore	83426	Fillmore	68551	Gage	68602	Gage
76558	Fillmore	91641	Fillmore	68552	Gage	68603	Gage
76559	Fillmore	92177	Fillmore	68553	Gage	68606	Gage
76564	Fillmore	92749	Fillmore	68554	Gage	68607	Gage
76565	Fillmore	99794	Fillmore	68555	Gage	68608	Gage
76566	Fillmore	23099	Gage	68556	Gage	68609	Gage
76587	Fillmore	51659	Gage	68558	Gage	68610	Gage
76594	Fillmore	63449	Gage	68559	Gage	68612	Gage
76595	Fillmore	64388	Gage	68560	Gage	68613	Gage
76596	Fillmore	64456	Gage	68561	Gage	68614	Gage
76635	Fillmore	65752	Gage	68563	Gage	68615	Gage
76645	Fillmore	65806	Gage	68564	Gage	68616	Gage
76647	Fillmore	67335	Gage	68565	Gage	68617	Gage
76648	Fillmore	67360	Gage	68566	Gage	68618	Gage
78578	Fillmore	67983	Gage	68567	Gage	68619	Gage
79484	Fillmore	67984	Gage	68568	Gage	68620	Gage
79485	Fillmore	68519	Gage	68569	Gage	68621	Gage
79486	Fillmore	68520	Gage	68570	Gage	68622	Gage
79487	Fillmore	68521	Gage	68571	Gage	68623	Gage
79489	Fillmore	68522	Gage	68572	Gage	68624	Gage
79490	Fillmore	68523	Gage	68573	Gage	68625	Gage
79491	Fillmore	68524	Gage	68574	Gage	68626	Gage
79493	Fillmore	68525	Gage	68575	Gage	68627	Gage
79495	Fillmore	68526	Gage	68576	Gage	68628	Gage

Facility	County	Facility	County	Facility	County	Facility	County
68629	Gage	68682	Gage	75967	Gage	76050	Gage
68630	Gage	68683	Gage	75968	Gage	76051	Gage
68631	Gage	69034	Gage	75969	Gage	76052	Gage
68632	Gage	69061	Gage	75970	Gage	76053	Gage
68633	Gage	69806	Gage	75972	Gage	76054	Gage
68634	Gage	70043	Gage	75979	Gage	76055	Gage
68636	Gage	70716	Gage	75980	Gage	76056	Gage
68637	Gage	70721	Gage	75981	Gage	76058	Gage
68638	Gage	71183	Gage	75982	Gage	76059	Gage
68639	Gage	71205	Gage	75983	Gage	76060	Gage
68640	Gage	72304	Gage	75984	Gage	76061	Gage
68641	Gage	72306	Gage	75985	Gage	76062	Gage
68642	Gage	72307	Gage	75988	Gage	76063	Gage
68643	Gage	72308	Gage	75989	Gage	76065	Gage
68644	Gage	72310	Gage	75991	Gage	76066	Gage
68645	Gage	72317	Gage	75992	Gage	76067	Gage
68646	Gage	72656	Gage	75993	Gage	76068	Gage
68647	Gage	72746	Gage	76000	Gage	76069	Gage
68649	Gage	73002	Gage	76001	Gage	76071	Gage
68650	Gage	73100	Gage	76002	Gage	76072	Gage
68652	Gage	73228	Gage	76003	Gage	76073	Gage
68653	Gage	73305	Gage	76006	Gage	76075	Gage
68654	Gage	73308	Gage	76011	Gage	76076	Gage
68656	Gage	73310	Gage	76012	Gage	76077	Gage
68657	Gage	73312	Gage	76014	Gage	76078	Gage
68658	Gage	73313	Gage	76015	Gage	76083	Gage
68659	Gage	73314	Gage	76018	Gage	76084	Gage
68660	Gage	73315	Gage	76030	Gage	76086	Gage
68662	Gage	73317	Gage	76031	Gage	76088	Gage
68664	Gage	73379	Gage	76032	Gage	76089	Gage
68665	Gage	73485	Gage	76033	Gage	76090	Gage
68666	Gage	73487	Gage	76034	Gage	76091	Gage
68667	Gage	73616	Gage	76035	Gage	76092	Gage
68668	Gage	74265	Gage	76036	Gage	76093	Gage
68669	Gage	74585	Gage	76037	Gage	76094	Gage
68670	Gage	74587	Gage	76039	Gage	76100	Gage
68671	Gage	75565	Gage	76040	Gage	76102	Gage
68672	Gage	75698	Gage	76041	Gage	76103	Gage
68674	Gage	75951	Gage	76042	Gage	76105	Gage
68675	Gage	75952	Gage	76043	Gage	76106	Gage
68676	Gage	75953	Gage	76044	Gage	76107	Gage
68677	Gage	75955	Gage	76045	Gage	76108	Gage
68678	Gage	75956	Gage	76046	Gage	76109	Gage
68679	Gage	75961	Gage	76047	Gage	76110	Gage
68680	Gage	75963	Gage	76048	Gage	76111	Gage
68681	Gage	75965	Gage	76049	Gage	76112	Gage

Facility	County	Facility	County	Facility	County	Facility	County
76113	Gage	79396	Gage	79475	Gage	66307	Hamilton
76114	Gage	79397	Gage	79476	Gage	66314	Hamilton
76115	Gage	79399	Gage	79477	Gage	66315	Hamilton
76116	Gage	79400	Gage	79479	Gage	66316	Hamilton
76117	Gage	79409	Gage	81476	Gage	66317	Hamilton
76118	Gage	79410	Gage	82497	Gage	66318	Hamilton
76119	Gage	79411	Gage	82596	Gage	66319	Hamilton
76121	Gage	79412	Gage	83446	Gage	66320	Hamilton
76128	Gage	79413	Gage	85955	Gage	66321	Hamilton
76129	Gage	79417	Gage	86977	Gage	66322	Hamilton
76183	Gage	79418	Gage	87018	Gage	66324	Hamilton
76185	Gage	79419	Gage	90267	Gage	66325	Hamilton
76187	Gage	79420	Gage	90921	Gage	66326	Hamilton
76189	Gage	79425	Gage	24994	Hall	66328	Hamilton
76190	Gage	79426	Gage	25654	Hall	66329	Hamilton
76192	Gage	79427	Gage	61653	Hall	66330	Hamilton
76205	Gage	79428	Gage	66420	Hall	66331	Hamilton
76206	Gage	79429	Gage	71477	Hall	66332	Hamilton
76207	Gage	79430	Gage	72001	Hall	66333	Hamilton
76208	Gage	79433	Gage	77433	Hall	66334	Hamilton
76236	Gage	79434	Gage	79513	Hall	66335	Hamilton
76238	Gage	79435	Gage	79544	Hall	66336	Hamilton
76239	Gage	79436	Gage	79572	Hall	66337	Hamilton
76240	Gage	79437	Gage	79575	Hall	66338	Hamilton
76241	Gage	79438	Gage	79635	Hall	66339	Hamilton
76243	Gage	79439	Gage	79684	Hall	66340	Hamilton
76244	Gage	79440	Gage	79999	Hall	66341	Hamilton
76245	Gage	79441	Gage	80027	Hall	66342	Hamilton
76246	Gage	79455	Gage	80042	Hall	66343	Hamilton
76247	Gage	79456	Gage	80061	Hall	66344	Hamilton
76507	Gage	79457	Gage	80063	Hall	66345	Hamilton
76510	Gage	79458	Gage	80064	Hall	66347	Hamilton
76858	Gage	79459	Gage	81480	Hall	66348	Hamilton
79382	Gage	79460	Gage	81486	Hall	66349	Hamilton
79383	Gage	79461	Gage	90866	Hall	66350	Hamilton
79384	Gage	79462	Gage	55049	Hamilton	66351	Hamilton
79385	Gage	79463	Gage	64443	Hamilton	66352	Hamilton
79387	Gage	79464	Gage	64444	Hamilton	66354	Hamilton
79388	Gage	79465	Gage	66290	Hamilton	66355	Hamilton
79389	Gage	79468	Gage	66291	Hamilton	66356	Hamilton
79390	Gage	79469	Gage	66292	Hamilton	66357	Hamilton
79391	Gage	79470	Gage	66294	Hamilton	66358	Hamilton
79392	Gage	79471	Gage	66297	Hamilton	66359	Hamilton
79393	Gage	79472	Gage	66299	Hamilton	66362	Hamilton
79394	Gage	79473	Gage	66302	Hamilton	66363	Hamilton
79395	Gage	79474	Gage	66305	Hamilton	66364	Hamilton

Facility	County	Facility	County	Facility	County	Facility	County
66365	Hamilton	75094	Hamilton	78203	Hamilton	71216	Jefferson
66366	Hamilton	75096	Hamilton	78204	Hamilton	71319	Jefferson
66367	Hamilton	75098	Hamilton	78206	Hamilton	71321	Jefferson
66368	Hamilton	75099	Hamilton	78210	Hamilton	71389	Jefferson
66369	Hamilton	75100	Hamilton	78211	Hamilton	72178	Jefferson
66371	Hamilton	75104	Hamilton	78212	Hamilton	72214	Jefferson
66372	Hamilton	75106	Hamilton	78214	Hamilton	72216	Jefferson
66374	Hamilton	75108	Hamilton	78215	Hamilton	73367	Jefferson
66375	Hamilton	75110	Hamilton	78216	Hamilton	73473	Jefferson
66377	Hamilton	75111	Hamilton	78219	Hamilton	73760	Jefferson
66378	Hamilton	75112	Hamilton	78220	Hamilton	76512	Jefferson
66379	Hamilton	75113	Hamilton	78237	Hamilton	77135	Jefferson
66380	Hamilton	75114	Hamilton	78303	Hamilton	77265	Jefferson
66381	Hamilton	75115	Hamilton	78327	Hamilton	77268	Jefferson
66383	Hamilton	75116	Hamilton	86944	Hamilton	77271	Jefferson
66385	Hamilton	75117	Hamilton	86946	Hamilton	77272	Jefferson
66386	Hamilton	75118	Hamilton	87167	Hamilton	77284	Jefferson
66406	Hamilton	75119	Hamilton	90175	Hamilton	77285	Jefferson
66407	Hamilton	75121	Hamilton	90515	Hamilton	77287	Jefferson
66409	Hamilton	75123	Hamilton	92765	Hamilton	77288	Jefferson
66412	Hamilton	75124	Hamilton	63447	Jefferson	77291	Jefferson
66424	Hamilton	75128	Hamilton	66036	Jefferson	77293	Jefferson
66425	Hamilton	75129	Hamilton	66675	Jefferson	77294	Jefferson
66427	Hamilton	75130	Hamilton	66684	Jefferson	77296	Jefferson
66429	Hamilton	75174	Hamilton	66686	Jefferson	77298	Jefferson
66430	Hamilton	75411	Hamilton	66687	Jefferson	77301	Jefferson
66434	Hamilton	78163	Hamilton	66688	Jefferson	77305	Jefferson
69102	Hamilton	78164	Hamilton	66695	Jefferson	77306	Jefferson
71007	Hamilton	78166	Hamilton	66700	Jefferson	77307	Jefferson
71176	Hamilton	78170	Hamilton	66701	Jefferson	77314	Jefferson
71395	Hamilton	78181	Hamilton	66702	Jefferson	77315	Jefferson
71396	Hamilton	78182	Hamilton	66703	Jefferson	77319	Jefferson
71417	Hamilton	78183	Hamilton	66706	Jefferson	77321	Jefferson
71425	Hamilton	78186	Hamilton	66726	Jefferson	77322	Jefferson
71426	Hamilton	78187	Hamilton	66728	Jefferson	77323	Jefferson
71450	Hamilton	78188	Hamilton	66730	Jefferson	77325	Jefferson
71451	Hamilton	78189	Hamilton	66735	Jefferson	77327	Jefferson
72991	Hamilton	78190	Hamilton	66737	Jefferson	77328	Jefferson
73065	Hamilton	78192	Hamilton	66738	Jefferson	77331	Jefferson
73081	Hamilton	78193	Hamilton	66739	Jefferson	77335	Jefferson
73109	Hamilton	78195	Hamilton	66740	Jefferson	77339	Jefferson
73400	Hamilton	78196	Hamilton	66741	Jefferson	77343	Jefferson
74264	Hamilton	78197	Hamilton	66746	Jefferson	77345	Jefferson
74764	Hamilton	78198	Hamilton	66752	Jefferson	77346	Jefferson
75059	Hamilton	78199	Hamilton	69564	Jefferson	77378	Jefferson
75093	Hamilton	78201	Hamilton	70773	Jefferson	79647	Jefferson

Facility	County	Facility	County	Facility	County	Facility	County
79653	Jefferson	66926	Polk	76453	Polk	79950	Polk
79657	Jefferson	66928	Polk	76462	Polk	79952	Polk
79658	Jefferson	66929	Polk	76463	Polk	79954	Polk
79659	Jefferson	66931	Polk	76464	Polk	79955	Polk
79660	Jefferson	66932	Polk	76465	Polk	79956	Polk
79664	Jefferson	66933	Polk	76466	Polk	79958	Polk
79665	Jefferson	66934	Polk	76468	Polk	79960	Polk
79667	Jefferson	66935	Polk	76477	Polk	79961	Polk
79673	Jefferson	66936	Polk	76478	Polk	79964	Polk
87014	Jefferson	66938	Polk	79869	Polk	79966	Polk
92113	Jefferson	66940	Polk	79870	Polk	79967	Polk
92818	Jefferson	66943	Polk	79871	Polk	79969	Polk
79722	Kearney	66944	Polk	79876	Polk	90582	Polk
68833	Lancaster	66945	Polk	79877	Polk	90583	Polk
68887	Lancaster	66946	Polk	79878	Polk	40909	Saline
69046	Lancaster	66948	Polk	79879	Polk	40953	Saline
70715	Lancaster	66950	Polk	79883	Polk	41192	Saline
79795	Lancaster	66957	Polk	79885	Polk	67147	Saline
66460	Nuckolls	66960	Polk	79893	Polk	67148	Saline
69189	Pawnee	71200	Polk	79895	Polk	67149	Saline
69205	Pawnee	72039	Polk	79896	Polk	67150	Saline
69210	Pawnee	72225	Polk	79897	Polk	67151	Saline
72299	Pawnee	72227	Polk	79898	Polk	67152	Saline
73168	Pawnee	72228	Polk	79899	Polk	67153	Saline
73171	Pawnee	72229	Polk	79900	Polk	67154	Saline
77407	Pawnee	72835	Polk	79901	Polk	67155	Saline
77408	Pawnee	72837	Polk	79902	Polk	67156	Saline
77410	Pawnee	73361	Polk	79903	Polk	67157	Saline
77411	Pawnee	73551	Polk	79906	Polk	67158	Saline
79982	Pawnee	73673	Polk	79907	Polk	67161	Saline
79986	Pawnee	74181	Polk	79909	Polk	67162	Saline
100752	Pawnee	74261	Polk	79910	Polk	67163	Saline
39723	Polk	74263	Polk	79912	Polk	67164	Saline
39763	Polk	74266	Polk	79913	Polk	67165	Saline
39802	Polk	74907	Polk	79914	Polk	67166	Saline
61460	Polk	74908	Polk	79916	Polk	67167	Saline
66912	Polk	76362	Polk	79917	Polk	67168	Saline
66915	Polk	76364	Polk	79918	Polk	67170	Saline
66916	Polk	76369	Polk	79920	Polk	67171	Saline
66917	Polk	76374	Polk	79922	Polk	67172	Saline
66918	Polk	76375	Polk	79923	Polk	67173	Saline
66919	Polk	76388	Polk	79925	Polk	67174	Saline
66920	Polk	76390	Polk	79935	Polk	67176	Saline
66922	Polk	76405	Polk	79939	Polk	67177	Saline
66924	Polk	76451	Polk	79945	Polk	67178	Saline
66925	Polk	76452	Polk	79947	Polk	67180	Saline

Facility	County	Facility	County	Facility	County	Facility	County
67182	Saline	79840	Saline	67194	Seward	73750	Seward
67183	Saline	79842	Saline	67195	Seward	74269	Seward
67184	Saline	79844	Saline	67197	Seward	74586	Seward
70995	Saline	79845	Saline	67198	Seward	74589	Seward
73032	Saline	79847	Saline	67201	Seward	74597	Seward
73303	Saline	79848	Saline	67202	Seward	75571	Seward
73365	Saline	79881	Saline	67203	Seward	75589	Seward
73368	Saline	79882	Saline	67204	Seward	75590	Seward
73381	Saline	79884	Saline	67205	Seward	75591	Seward
73417	Saline	79886	Saline	67206	Seward	75592	Seward
76450	Saline	79887	Saline	67208	Seward	75593	Seward
76458	Saline	79888	Saline	67209	Seward	75595	Seward
76459	Saline	79889	Saline	67210	Seward	75597	Seward
76460	Saline	79890	Saline	67213	Seward	75598	Seward
76470	Saline	79970	Saline	67214	Seward	75599	Seward
76474	Saline	79973	Saline	67215	Seward	75605	Seward
76475	Saline	79976	Saline	67216	Seward	75607	Seward
76735	Saline	79977	Saline	67219	Seward	75609	Seward
77468	Saline	79978	Saline	67220	Seward	75610	Seward
77469	Saline	79979	Saline	67221	Seward	75611	Seward
77470	Saline	79980	Saline	67224	Seward	75612	Seward
77472	Saline	79981	Saline	67225	Seward	75613	Seward
77474	Saline	79985	Saline	67226	Seward	75616	Seward
77475	Saline	80169	Saline	67227	Seward	75618	Seward
77478	Saline	80658	Saline	67229	Seward	75619	Seward
77479	Saline	81479	Saline	67230	Seward	75620	Seward
77480	Saline	81502	Saline	67231	Seward	75621	Seward
77483	Saline	82590	Saline	67234	Seward	75623	Seward
77486	Saline	83326	Saline	67237	Seward	75624	Seward
77487	Saline	86083	Saline	67238	Seward	75625	Seward
77488	Saline	86503	Saline	67241	Seward	75626	Seward
77489	Saline	87094	Saline	68757	Seward	75627	Seward
77492	Saline	87826	Saline	69559	Seward	75628	Seward
77493	Saline	45208	Seward	69560	Seward	75629	Seward
77495	Saline	45308	Seward	70991	Seward	75630	Seward
77496	Saline	50037	Seward	71167	Seward	75632	Seward
77500	Saline	61508	Seward	72240	Seward	75634	Seward
77502	Saline	64285	Seward	72242	Seward	75635	Seward
77509	Saline	67185	Seward	72243	Seward	75637	Seward
77511	Saline	67186	Seward	72839	Seward	75640	Seward
77531	Saline	67187	Seward	72974	Seward	75641	Seward
79421	Saline	67188	Seward	72989	Seward	75642	Seward
79831	Saline	67189	Seward	73243	Seward	75645	Seward
79837	Saline	67190	Seward	73295	Seward	75649	Seward
79838	Saline	67191	Seward	73486	Seward	75650	Seward
79839	Saline	67192	Seward	73499	Seward	75651	Seward

Facility	County	Facility	County	Facility	County	Facility	County
75653	Seward	80163	Seward	80410	Seward	67313	York
75654	Seward	80165	Seward	80415	Seward	67314	York
75655	Seward	80166	Seward	80417	Seward	67315	York
75657	Seward	80167	Seward	81978	Seward	67316	York
75658	Seward	80168	Seward	82595	Seward	67317	York
75659	Seward	80178	Seward	84007	Seward	67319	York
75675	Seward	80181	Seward	86393	Seward	67320	York
75687	Seward	80183	Seward	86438	Seward	67322	York
75701	Seward	80185	Seward	88219	Seward	67323	York
75704	Seward	80186	Seward	91544	Seward	67324	York
75706	Seward	80187	Seward	94651	Seward	67325	York
75709	Seward	80188	Seward	47859	York	67326	York
75711	Seward	80190	Seward	48229	York	67327	York
75714	Seward	80192	Seward	61885	York	67329	York
75719	Seward	80193	Seward	63431	York	67330	York
75722	Seward	80194	Seward	64393	York	67331	York
75723	Seward	80196	Seward	67275	York	67334	York
75724	Seward	80199	Seward	67276	York	67336	York
75726	Seward	80237	Seward	67277	York	67337	York
75727	Seward	80238	Seward	67278	York	67338	York
75730	Seward	80339	Seward	67279	York	67339	York
75731	Seward	80340	Seward	67280	York	67340	York
75800	Seward	80341	Seward	67281	York	67341	York
75803	Seward	80342	Seward	67283	York	67342	York
75804	Seward	80343	Seward	67284	York	67343	York
75806	Seward	80344	Seward	67285	York	67344	York
75808	Seward	80345	Seward	67287	York	67345	York
75809	Seward	80346	Seward	67288	York	67346	York
75810	Seward	80348	Seward	67289	York	67349	York
75845	Seward	80349	Seward	67290	York	67350	York
75850	Seward	80350	Seward	67291	York	67351	York
75851	Seward	80352	Seward	67293	York	67354	York
75853	Seward	80353	Seward	67294	York	67355	York
75854	Seward	80354	Seward	67295	York	69541	York
75858	Seward	80396	Seward	67296	York	69558	York
75864	Seward	80398	Seward	67297	York	70011	York
75886	Seward	80399	Seward	67299	York	70012	York
80151	Seward	80400	Seward	67303	York	70704	York
80152	Seward	80401	Seward	67305	York	71164	York
80155	Seward	80402	Seward	67306	York	72154	York
80156	Seward	80403	Seward	67307	York	72217	York
80157	Seward	80404	Seward	67308	York	72218	York
80158	Seward	80405	Seward	67309	York	72219	York
80159	Seward	80406	Seward	67310	York	72220	York
80160	Seward	80407	Seward	67311	York	72235	York
80162	Seward	80408	Seward	67312	York	72236	York

Facility	County	Facility	County	Facility	County		
72247	York	75762	York	86215	York		
72248	York	75765	York	87310	York		
72249	York	75766	York	90052	York		
72250	York	75767	York				
72251	York	75768	York				
72252	York	75769	York				
72952	York	75770	York				
72953	York	75771	York				
73016	York	75772	York				
73056	York	75773	York				
73095	York	76488	York				
73759	York	76501	York				
74262	York	80091	York				
74276	York	80098	York				
74450	York	80099	York				
74472	York	80100	York				
74884	York	80101	York				
74886	York	80102	York				
75329	York	80104	York				
75334	York	80105	York				
75335	York	80106	York				
75670	York	80108	York				
75671	York	80109	York				
75672	York	80113	York				
75678	York	80114	York				
75685	York	80115	York				
75688	York	80117	York				
75691	York	80118	York				
75692	York	80119	York				
75693	York	80123	York				
75694	York	80124	York				
75710	York	80125	York				
75712	York	80127	York				
75732	York	80129	York				
75734	York	80130	York				
75738	York	80132	York				
75748	York	80134	York				
75750	York	80138	York				
75751	York	80139	York				
75752	York	80140	York				
75753	York	80141	York				
75754	York	80142	York				
75755	York	80144	York				
75758	York	81505	York				
75759	York	81509	York				
75761	York	83571	York				